Beechcraft®

MUSKETEER
19, 19A, B19
23, A23, A23A, B23, C23
24, A24, A24R

SPORT 150 B19
SUNDOWNER 180 C23
SIERRA A24R
SIERRA 200 B24R,C24R

SHOP MANUAL

PUBLISHED BY
PARTS AND SERVICE OPERATIONS
BEECH AIRCRAFT CORPORATION
WICHITA, KANSAS 67201
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General Aviation Manufacturers Association

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Listed below are the pages required for this publication, with effectivity current through the revision and/or reissue code shown on the lower right corner of this page, and on the title page. Each page is followed by an entry that denotes whether the page is still as originally issued or is a part of some later revision or reissue.

LIST OF EFFECTIVE PAGES

Always destroy superseded pages when you insert revised pages.

LOG OF REVISIONS

F REISSUE	MARCH 1974
F1 REVISION	DECEMBER 5, 1975
F2 REVISION	DECEMBER 21, 1976
F3 REVISION	MARCH 3, 1977
F4 REVISION	JUNE 29, 1977
F5 REVISION	OCTOBER 6, 1978
F6 REVISION	DECEMBER 29, 1978 3-23-79

LIST OF EFFECTIVE PAGES

Title	F6	December 29, 1978	3-18 thru 3-18A	F1	December 5, 1975
A	F6	December 29, 1978	3-19 thru 3-37		Original
i	F2	December 21, 1976	3-38	F4	June 29, 1977
ii		Original	3-39 thru 3-40A	F6	December 29, 1978
iii thru vi	F6	December 29, 1978	3-41 thru 3-42	F6	December 29, 1978
vii	F1	December 5, 1975	3-42A		Original
1-1 thru 1-4		Original	3-42B	F6	December 29, 1978
1-5 thru 1-8	F2	December 21, 1976	3-43		Original
1-9 thru 1-12		Original	3-44	F6	December 29, 1978
1-13	F2	December 21, 1976	3-44A	F6	December 29, 1978
1-14		Original	3-44B	F6	December 29, 1978
2-1	F1	December 5, 1975	3-45		Original
2-2 thru 2-4		Original	3-46	F4	June 29, 1977
2-5 thru 2-6	F2	December 21, 1976	3-47		Original
2-6A		Original	3-48	F2	December 21, 1976
2-7 thru 2-10		Original	3-48A thru 3-48C		Original
2-11	F2	December 21, 1976	3-49 thru 3-52		Original
2-12 thru 2-16		Original	3-53 thru 3-54B	F1	December 5, 1975
2-16A thru 2-16B	F2	December 21, 1976	3-55	F1	December 5, 1975
2-17	F4	June 29, 1977	3-56		Original
2-18 thru 2-20	F2	December 21, 1976	3-57 thru 3-58A	F2	December 21, 1976
2-21 thru 2-22	F1	December 5, 1975	3-59 thru 3-63		Original
2-22A	F4	June 29, 1977	3-64	F2	December 21, 1976
2-23	F4	June 29, 1977	3-64A		Original
2-24 thru 2-25		Original	3-65		Original
3-1		Original	4-1 thru 4-76	F5	October 6, 1978
3-2	F4	June 29, 1977	5-1 thru 5-9	F6	December 29, 1978
3-3 thru 3-13		Original	6-1		Original
3-14 thru 3-14A	F1	December 5, 1975	6-2 thru 6-3	F2	December 21, 1976
3-15 thru 3-16A		Original			
3-17		Original			

98-34406A

F6

Basic publications are assigned a part number which appears on the title page with the date of the issue. Subsequent revisions are identified by the addition of a revision code after the part number. A1 after a part number denotes the first revision to the basic publication, A2 the second, etc. Occasionally, it is necessary to completely reissue and reprint a publication for the purpose of obsoleting a previous issue and outstanding revisions thereto. As these replacement reissues are made, the code will also change to the next successive letter of the alphabet at each issue. For example, B for the first reissue, C for the second reissue, etc.

When ordering a manual, give the basic number, and the reissue code when applicable, if a complete up-to-date publication is desired. Should only revision pages be required, give the basic number and revision code for the particular set of revision pages you desire.

ALPHABETICAL INDEX

A

B

B

C

C

D

E

E

F

F

G

G

H

I

I

J

K

L

M

N

N

O

P

P

R

R

S

S

S

T

T

U

V

W

GENERAL INFORMATION

SECTION I

GENERAL INFORMATION

This section includes a three view drawing, general information in chart form, on servicing, maintenance and rigging and a vendor publications list.

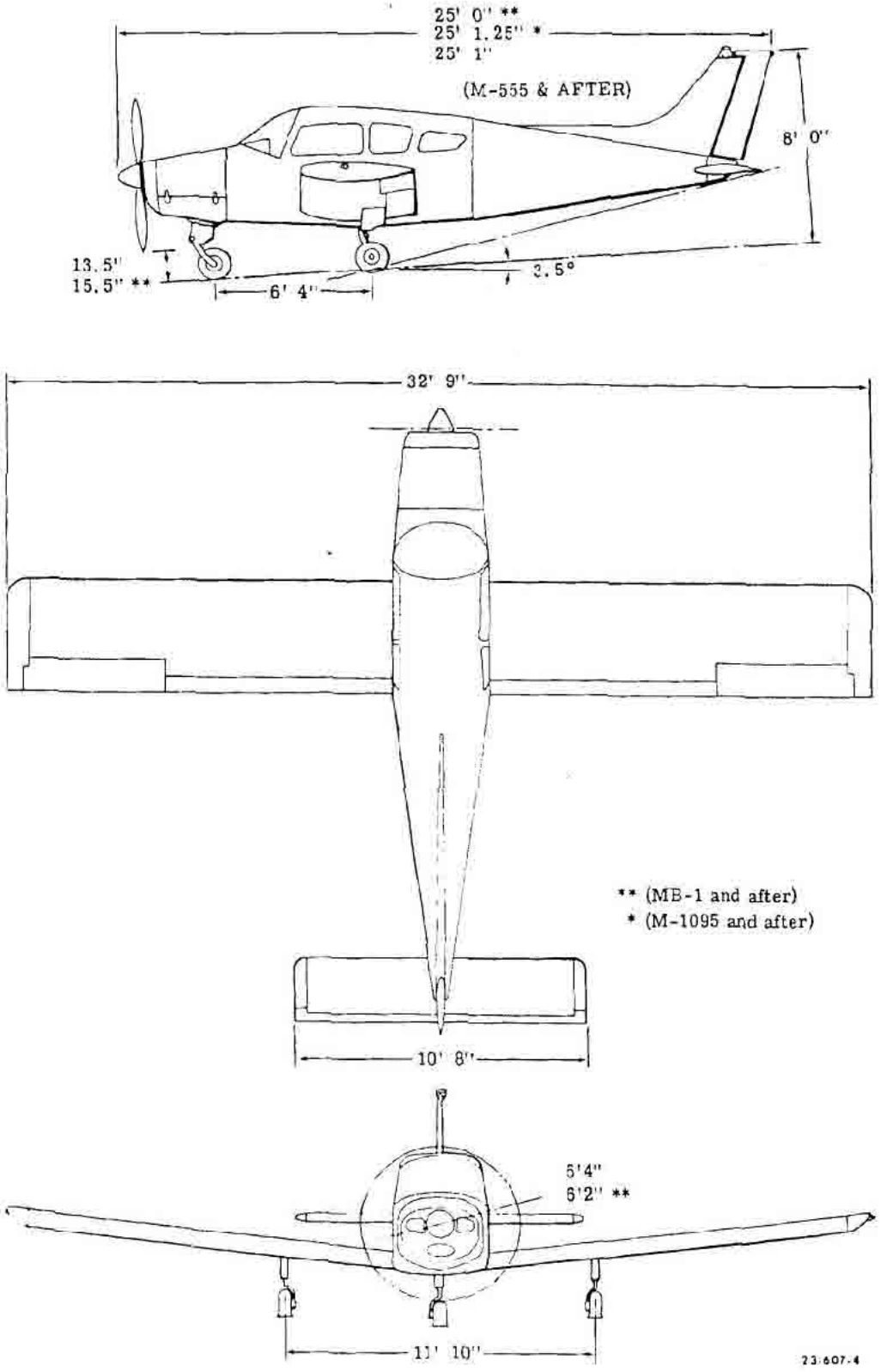

Figure 1-1. Dimensions of Aircraft (M-1 thru M-1284 and MB-1 thru MB-480)

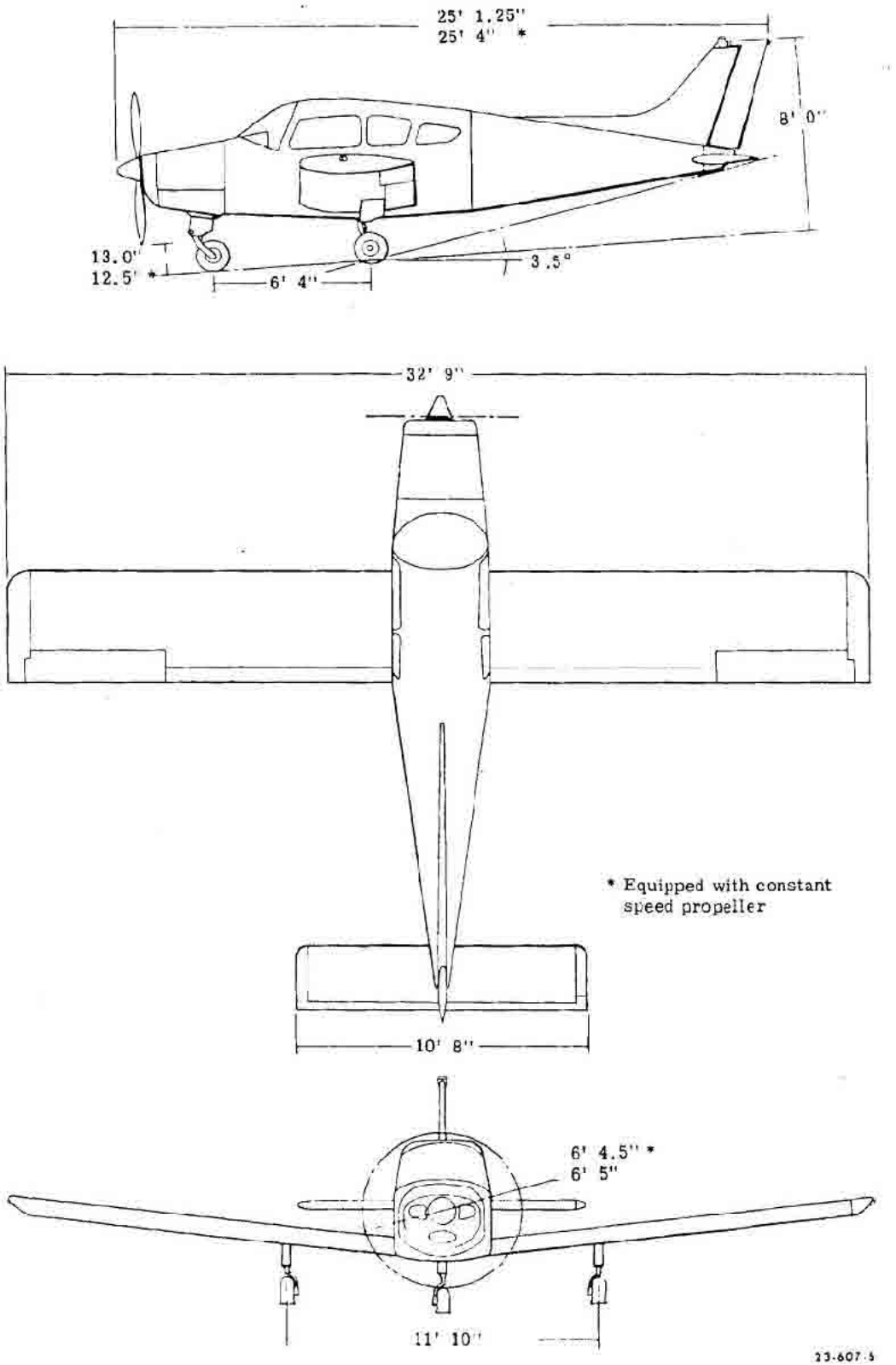

Figure 1-2. Dimensions of Aircraft (MA-1 thru MA-363)

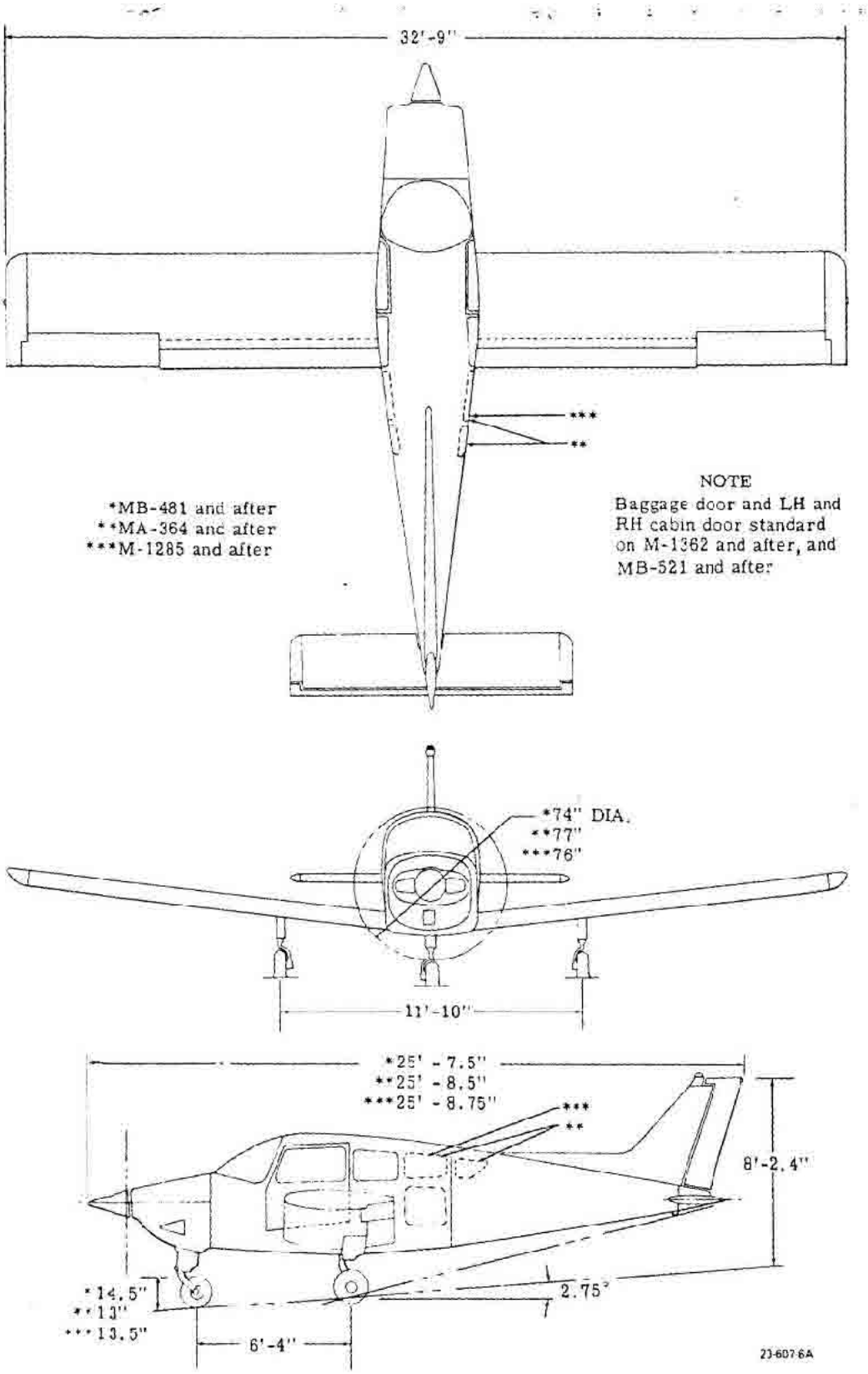

Figure 1-3. Dimensions of Aircraft (M-1285 and after, MA-364 and after and MB-481 and after)

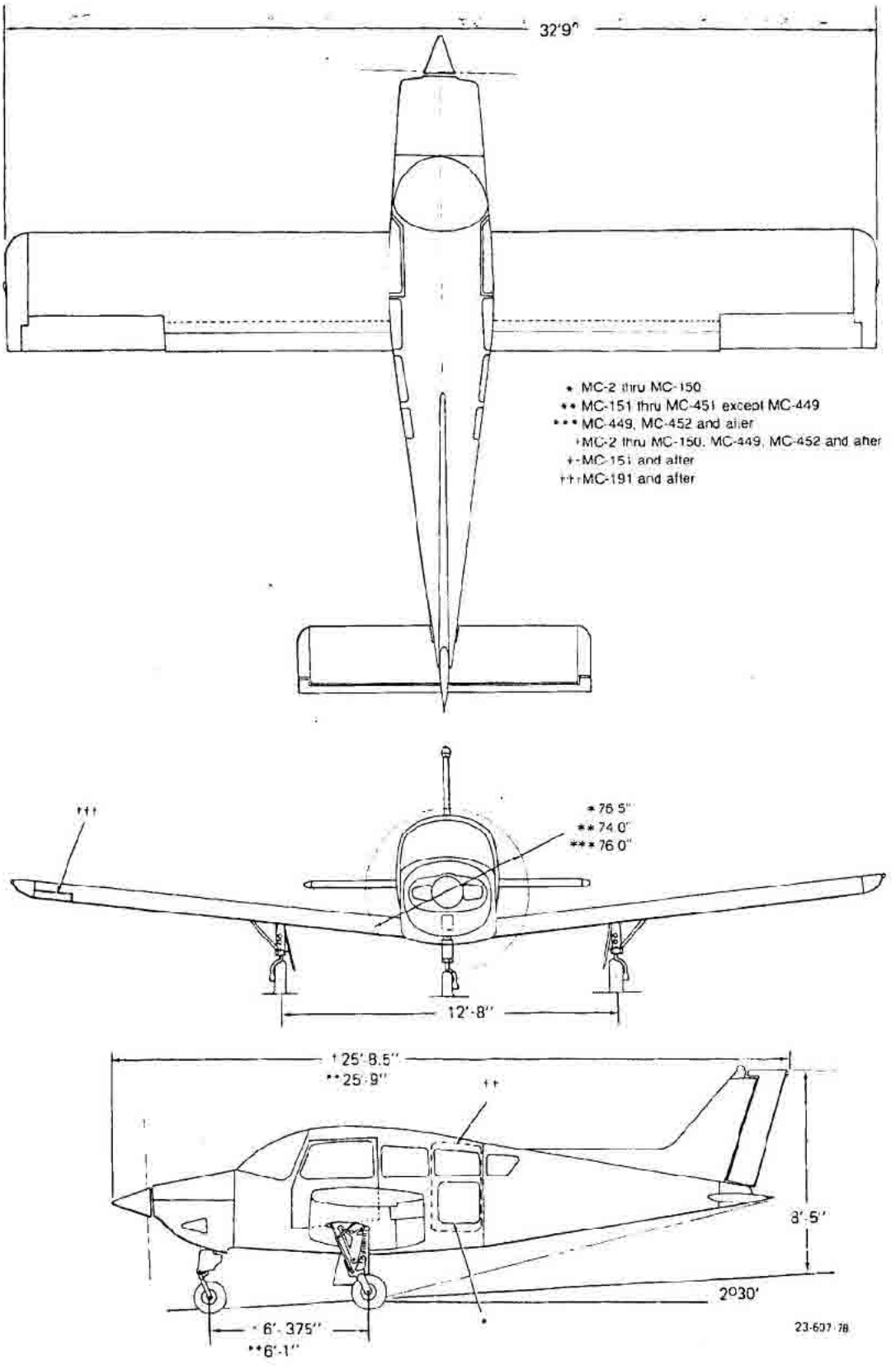

Figure 1-4. Dimensions of Aircraft (MC-2 and after)

ENGINE

Airplane	Manufacturer	Number	Horsepower
23	Lycoming	O-320-D2B	160 @ 2700 RPM
A23 and A23A	Continental	IO-346-A	165 @ 2700 RPM
B23	Lycoming	O-360-A2G	180 @ 2700 RPM
C23	Lycoming	O-360-A2G	180 @ 2700 RPM
		O-360-A4G	180 @ 2700 RPM
		O-360-A4J	180 @ 2700 RPM
19	Lycoming	O-320-E2B	150 @ 2700 RPM
		O-320-E2C	150 @ 2700 RPM
19A	Lycoming	O-320-E2C	150 @ 2700 RPM
B19	Lycoming	O-320-E2C	150 @ 2700 RPM
		O-320-E3D	150 @ 2700 RPM
24	Lycoming	IO-360-A2B	200 @ 2700 RPM
Equipped with constant speed propeller		IO-360-A1B	200 @ 2700 RPM
A24	Lycoming	IO-360-A2B	200 @ 2700 RPM
Equipped with constant speed propeller		IO-360-A1B	200 @ 2700 RPM
A24R	Lycoming	IO-360-A1B	200 @ 2700 RPM
		IO-360-A1D	200 @ 2700 RPM
B24R	Lycoming	IO-360-A1B6	200 @ 2700 RPM
C24R	Lycoming	IO-360-A1B6	200 @ 2700 RPM

FIRING ORDER

1 - 3 - 2 - 4

MAGNETO TIMING

Airplane	Degrees BTC (Before top center of number 1 cylinder)
23, 19, 19A, 24, B23, C23, B19, A24 and A24R, B24R (MC-2 thru MC-388 and MC-393)	25°
A23, A23A	24° + 0° -2°
B24R, C24R, (MC-389 and after, except MC-393)	20°

MAGNETO CONTACT POINT CLEARANCE

Airplane	"E" Gap	Main	Retard
A23, A23A	10° ± 4	.018 ± .006	.018 ± .006
23, 19, 19A, 24 B23, *C23, *B19, A24, A24R B24R, C24R	15° ± 2°	.016 ± .003	.016 ± .006

*Serials MB-540, MB-553 and after, M-1672, M-1673, M-1674, M-1676, M-1677, M-1678, M-1679, M-1682, M-1684, M-1686, M-1687, M-1688, M-1693, M-1698, M-1702, M-1703, M-1705 and after utilize Slick 4000 series magnetos which are considered non-servicable

OIL PRESSURE

Airplane	Minimum Idling	Normal Operating
A23 and A23A	10 psi	30 to 60 psi
23, 19, 19A, B19, B23 and C23	25 psi	60 to 90 psi
24, A24, A24R B24R and C24R	25 psi	65 to 90 psi

INDUCTION AIR FILTER

The filter must be cleaned daily when operating in dusty conditions. When operating in other than dusty conditions, clean as required. The required maximum time for servicing is 25 hours.

IDLE SPEED

23, A23, A23A, B23,C23, 24,A24,A24R,B24R,C24R	650 rpm
19, 19A and B19	550 rpm

FUEL SYSTEM

FUEL GRADE

Airplane	Grade
M-1, M-2, M-4 thru M-554, M-1095 and after	91/96 octane-blue, 100 octane Low Lead-blue 100/130 octane - green
M-3, M-555 thru M-1094	100/130 octane-green, 100 octane Low Lead - blue
MA-1 thru MA-368	100/130 octane - green 100 octane Low Lead - blue
MB-1 and after	80/87 octane - red 100 octane Low Lead - blue
MC-2 and after	100/130 octane - green 100 octane Low Lead - blue

MISCELLANEOUS

BRAKE DISC AND LINING WEAR LIMITS

Replace linings if space between disc and the flat surface of the housing is .312 (5/16) inch. Minimum brake disc thickness is .225 inch	MB-1 through MB-521 M-1 through M-1361 MA-1 through MA-368 MC-2 through MC-97
Minimum lining thickness is .107 inch above the rivet. Minimum brake disc thickness is .205 inch	MB-522 and after M-1362 and after MC-98 and after and any aircraft that have converted from Goodyear to Cleveland wheels and brakes.

SUCTION RELIEF VALVE Set at 5.0 inches Hg. at 2000 rpm.

STALL WARNING SWITCH Adjust 5 to 7 mph before a complete stall.

CONTROL SURFACE TRAVEL

Flap	0° Full Up 30° Full Down (M-1 thru M-554) 35° Full Down (M-555 and after, MA-1 thru MA-368, MB-1 and after and MC-2 and after)	
Aileron	20° ± 2° Up	10° ± 2° Down
Rudder	25° ± 2° Right	25° ± 2° Left
Stabilator	15° ± 2° Up	2° + 2° -1° Down
Stabilator Tab (With Stabilator in Neutral)	*2° ± 1° Up **1° ± 1° -1/2° Up	*15° + 2° -1° Down **10° + 2° -1° Down

*M-1 thru M-1412 and M-1415, M-1419, M-1423, M-1439 & M-1447; MA-1 thru MA-368; MB-1 thru MB-557; MC-2 thru MC-150 except MC-108.

**M-1413 and after except M-1415, M-1419, M-1423, M-1439 & M-1447; MB-558 and after; MC-108, MC-151 and after.

MOTOR BRUSH REPLACEMENT GUIDE

Starter	23, A23 and A23A. 19, 19A, 24, B23, C23, B19, A24, A24R, B24R and C24R	.25 in. minimum req. .30 in. minimum req.
Generator		.25 in. minimum req.
Alternator		.25 in. minimum req.
Tab Actuator Motor		Every 1,000 operating hrs. or 10,000 flight hrs.

SERVICE

Tire (Inflation)

Aircraft	Standard Size (15 X 6.00-6)	Optional Size (17.50 X 6.00-6)
23, A23, A23A, 19, 19A, B23, C23, B19	40 psi (Nose and Main)	20 to 22 psi (Nose and Main)
24, A24	60 psi (Nose and Main)	26 to 30 psi (Nose and Main)
A24R, B24R, C24R	Nose 35 psi (14.20 X 5.00-5)	Main 32 psi (17.50 X 6.00-6)
Oil Filter (Replace)	50 hours	(on serials M-555 through M-1094 equipped with Continental engines)

SERVICE (Cont'd)

Induction Air Filter (Replace)	300 hrs. or sooner if conditions warrant	
Induction Air Filter (Clean)	25 hrs. or sooner if conditions warrant	
Instrument Air Filter	50 hrs.	(If central air filter is not installed)
Gyro Instrument Central Air Filter (Replace)	500 hrs.	
Suction Relief Valve Screen (Clean)	100 hrs.	
Fuel System Screens and Strainers (Clean)	100 hrs. or sooner if conditions warrant	
Wheel Bearings (Lubricate)	100 hrs.	
Landing Gear Knee Pins (Lubricate)	25 hrs. or sooner if conditions warrant	

TABLE OF TORQUES

ENGINE

Engine mount to firewall	325 + 0 - 20 inch pounds
Engine Lord mounts to engine supports	475 ± 25 inch pounds
Oil filter center stud (Continental engine)	180 to 216 inch pounds
Oil filter center stud (Lycoming engine)	240 to 280 inch pounds
Spark plugs	
Continental engines	360 to 420 inch pounds
Lycoming engines	320 to 380 inch pounds

PROPELLER

Propeller mounting bolts	
M-1 thru M-554, MB-1 thru MB-474	300 inch pounds
M-555 and after and MB-475 and after	740 to 780 inch pounds
MA-1 and after with fixed pitch propeller	720 to 780 inch pounds
Propeller mounting nuts	
MA-1 and after, with constant speed propeller and MC-2 and after	660 to 720 inch pounds

FUEL SYSTEM

Fuel strainer retainer bolt	25 inch pounds as stamped on strainer

AIR FRAME

Wing attachment bolts	
See Wing Installation in Section 3	
Stabilator mounting bolts	
AN bolts	50 to 70 inch pounds
NAS bolts	90 to 110 inch pounds
Vertical stabilizer spar bolts	50 to 70 inch pounds

	WRENCH TORQUE FOR TIGHTENING AN818 NUT (POUND INCH)				HOSE END FITTING AND HOSE ASSEMBLIES (POUND INCH)	
TUBING OD INCHES	ALUMINUM-ALLOY TUBING FLARE AND10061 or AND10078		STEEL TUBING FLARE AND10061			
	MINIMUM	MAXIMUM	MINIMUM	MAXIMUM	MINIMUM	MAXIMUM
1/8	---	---	---	---	---	---
3/16	---	---	90	100	70	100
1/4	40	65	135	150	70	120
5/16	60	80	180	200	85	180
3/8	75	125	270	300	100	250
1/2	150	250	450	500	210	420
5/8	200	350	650	700	300	480
3/4	300	500	900	1000	500	850
1	500	700	1200	1400	700	1150
1-1/4	600	900	---	---	---	---
1-1/2	600	900	---	---	---	---
1-3/4	---	---	---	---	---	---
2	---	---	---	---	---	---

Fuel System Fitting Torque Values

TORQUING FINE THREAD SERIES BOLTS LOADED IN SHEAR

SIZE	TORQUE LIMITS RECOMMENDED (INCH-POUNDS)		MAXIMUM ALLOWABLE TORQUE (INCH-POUNDS)	
	AN365 and AN310 Nuts	AN364 and AN320 Nuts	AN365 and AN310 Nuts	AN364 and AN320 Nuts
	Column 1	Column 2	Column 3	Column 4
8-36	12-15	7-9	20	12
10-32	20-25	12-15	40	25
1/4-28	50-70	30-40	100	60
5/16-24	100-140	60-85	225	140
3/8-24	160-190	95-110	390	240
7/16-20	450-500	270-300	840	500
1/2-20	480-690	290-410	1100	660
9/16-18	800-1000	480-600	1600	960
5/8-18	1100-1300	660-780	2400	1400
3/4-16	2300-2500	1300-1500	5000	3000
7/8-14	2500-3000	1500-1800	7000	4200
1-14	3700-5500	2200-3300	10000	6000
1-1/8-12	5000-7000	3000-4200	15000	9000
1-1/4-12	9000-11000	5400-6600	25000	15000

The above values apply to Class 3 threads, cadmium plated and nonlubricated.

TORQUING COARSE THREAD SERIES BOLTS LOADED IN SHEAR

SIZE	TORQUE LIMITS RECOMMENDED (INCH-POUNDS)		MAXIMUM ALLOWABLE TORQUE (INCH-POUNDS)	
	AN365 and AN310 Nuts	AN364 and AN320 Nuts	AN365 and AN310 Nuts	AN364 and AN320 Nuts
	Column 1	Column 2	Column 3	Column 4
8-32	12-15	7-9	20	12
10-24	20-25	12-15	35	21
1/4-20	40-50	25-30	75	45
5/16-18	80-90	48-55	160	100
3/8-16	160-185	95-110	275	170
7/16-14	235-255	140-155	475	280
1/2-13	400-480	240-290	880	520
9/16-12	500-700	300-420	1100	650
5/8-11	700-900	420-540	1500	900
3/4-10	1150-1500	700-950	2500	1500
7/8-9	2200-3000	1300-1800	4600	2700
1-8	3700-5000	2200-3000	7600	4500
1-1/8-8	5500-6500	3300-4000	12000	7200
1-1/4-8	6500-8000	4000-5000	16000	10000

The above values apply to Class 3 threads, cadmium plated and nonlubricated.

Following is a list of publications providing servicing, overhaul and parts information on various components on the BEECHCRAFT 19, 23 and 24, which you may obtain to supplement the BEECHCRAFT Shop Manual. In most instances you should obtain the publications directly from the manufacturer or his distributor. Only a few, such as engine manuals and Beech supplementary publications, are available from Parts and Service Operations, Beech Aircraft Corporation. Those which are so available are listed in the current Publications Price List. Since a wide variety of radio equipment is available and because radio manufacturers normally supply parts and servicing manuals with each set, radio publications have not been included in the list.

As publications on additional components become available, they will be added to this list of publications.

VENDOR PUBLICATIONS

ENGINES

Operator's Manual, 0-320-E2B or E2C engine,P/N 60297-16; Lycoming Division, AVCO Mfg. Corp., 652 Oliver St., Williamsport, Penn., 17701

Operator's Manual, 0-320-D2B engine, P/N 60297-16; Lycoming Division, AVCO Mfg. Corp., 652 Oliver St., Williamsport, Penn., 17701

Operator's Manual, IO-360-AIB or A2B engine, P/N 60297-12; Lycoming Division, AVCO Mfg. Corp., 652 Oliver St., Williamsport, Penn., 17701

Operator's Manual, 0-360-A2G engine, P/N 60297-12, Lycoming Division, AVCO Mfg., Corp., 652 Oliver St., Williamsport, Penn., 17701.

Overhaul Manual, 0-320, 0-360 and IO-360 series engines, P/N 60294-7; Lycoming Division, AVCO Mfg. Corp., 652 Oliver St., Williamsport, Penn., 17701

Illustrated Parts Catalog, 0-320 series engines, P/N PC-103, Lycoming Division, AVCO Mfg. Corp., 652 Oliver St., Williamsport, Penn., 17701

Illustrated Parts Catalog, 0-360 series engines, P/N PC-106; Lycoming Division, AVCO Mfg. Corp., 652 Oliver St., Williamsport, Penn., 17701

Illustrated Parts Catalog IO-360 series engines, P/N PC-106; Lycoming Division, AVCO Mfg. Corp., 652 Oliver St., Williamsport, Penn., 17701

Operation and Maintenance Manual, IO-346-A engine, P/N X30029; Continental Motors Corp., 205 Market St., Muskegon, Mich., 49440

Maintenance and Overhaul Manual, IO-346-A engine, P/N X30027; Continental Motors Corp., 205 Market St., Muskegon, Mich., 49440

Illustrated Parts Catalog, IO-346-A engine, P/N X30028; Continental Motors Corp., 205 Market St., Muskegon, Mich., 49440

MAGNETOS

Service Parts List, S-200 series, Form L-528-2, Scintilla Division, Bendix Aviation Corp., Sherman Ave., Sidney, New York

Installation, Maintenance and Operation Instructions, S-200 series, Form L-526-2; Scintilla Division, Bendix Aviation Corp., Sherman Ave., Sidney, New York

Service Parts List, S-1200 series, Form L-608-1; Scintilla Division, Bendix Aviation Corp., Sherman Ave., Sidney, New York

MAGNETOS (Cont'd)

Service Parts List, S-1200 series, Form L-608-1; Scintilla Division, Bendix Aviation Corp., Sherman Ave., Sidney, New York

Overhaul Instructions, S-1200 series, Form L-645; Scintilla Division, Bendix Aviation Corp., Sherman Ave., Sidney, New York

Installation, Maintenance and Operation Instructions, S-1200 series; Scintilla Division, Bendix Aviation Corp., Sherman Ave., Sidney New York

FUEL INJECTION SYSTEM

Operation and Service Manual, Form 15-338B; Bendix Aviation Corp., 401 Bendix Drive, South Bend, Indiana, 46620

Overhaul and Parts Catalog for Fuel Injection Systems, P/N X30091; Continental Motors Corp., 205 Market St., Muskegon, Mich., 49440

ALTERNATORS

Test and Maintenance of Delcotrons, Bulletin IG-262; Delco Remy Corp., P.O. Box 640, Anderson, Indiana, 46011

Technical Data, Parts List for Prestolite Alternators; P/N OE-A1, Prestolite Company, P.O. Box 931, Toledo, Ohio

PROPELLER

Service Manual, Constant Speed, P/N 660115; McCauley Industrial Corp., 1840 Howell Ave., Dayton, Ohio, 45417

Service Manual, Fixed Pitch, P/N 651015; McCauley Industrial Corp., 1840 Howell Ave., Dayton, Ohio 45417

Overhaul Instructions, P/N 113B, for Hartzell Propeller, Hartzell Propeller Inc. Piqua, Ohio.

Owner's Manual, P/N 115B, for Hartzell Propeller, Hartzell Propeller Inc., Piqua, Ohio.

AUTOPILOT

Flight Procedures Manual, B7 Autopilot, P/N 3959; Brittain Industries, Commerce Drive, Fort Washington, Pennsylvania, 19034

Troubleshooting, B7 Autopilot, P/N 3960; Brittain Industries, Commerce Drive, Fort Washington, Pennsylvania 19034

Maintenance Manual, B5 Autopilot, P/N 3950; Brittain Industries, Commerce Drive, Fort Washington, Pennsylvania 19034

Ground and Flight Check Procedures, B5 Autopilot, P/N 3952; Brittain Industries, Commerce Drive, Fort Washington, Pennsylvania 19034

Installation, Operation and Maintenance, B4 and B4A Autopilot, P/N 11807; Brittain Industries, Commerce Drive, Fort Washington, Pennsylvania 19034

Operation and Service Instructions, B2C and B2D Autopilot, P/N 3953; Brittain Industries, Commerce Drive, Fort Washington, Pennsylvania 19034

AUTOPILOT (Cont'd)

Automatic Flight Systems Service Manual, P/N 68S73, Edo-Aire Mitchell P.O. Box 610, Municipal Airport, Mineral Wells, Texas 76067

BEECHCRAFT PUBLICATIONS

PROPELLER

Propeller Repair Manual for Sensenich Metal Propellers, P/N 98-34643

WHEELS, BRAKES AND TIRES

Maintenance Instructions for Wheels, Brakes and Tires, P/N 98-33661, MB-1 through MB-521, M-1 through M-1361, MA-1 through MA-368, MC-2 through MC-97

Servicing and Maintenance Instructions for Main Wheel, Nose Wheel and Brake Assembly, P/N 98-37045, MB-522 and after, M-1362 and after, MC-98 and after and any aircraft that have converted from Goodyear to Cleveland wheels and brakes

ALTERNATORS

Alternator Service Manual for 33-380009 and 33-380009-1 Alternator, P/N 92-31498

Service Manual and Illustrated Parts Breakdown for ALE-810SA Alternator, P/N 98-33733

BEECHCRAFT NEW-MATIC AUTOPILOT

New-Matic Pilot Operating Instructions, P/N 92-402

New-Matic Pilot Operating and Servicing Instructions, 34 Autopilot, P/N 130376A

New-Matic Maintenance Instructions, P/N 130409

New-Matic Operator's Manual, B5 Autopilot, P/N 888-34679

Operator's Manual, B5 and B7 Autopilot, P/N 98-35655

Electronics Components Maintenance Manual and Parts Breakdown B-5, B-5A, B-7, B-VII, B-VIII, Autopilot, P/N 98-35850

2

SERVICING AND LUBRICATION

SECTION II

SERVICING AND LUBRICATION

This section includes important information on lubrication, cleaning and minor servicing.

NOTE

Airplanes operated in other than normal operation and airplanes operated in humid tropics or cold and damp climates, etc., may need more frequent inspections for wear, corrosion and/or lack of lubrication. In these areas, periodic inspections should be performed until the operator can set his own inspection periods based on experience.

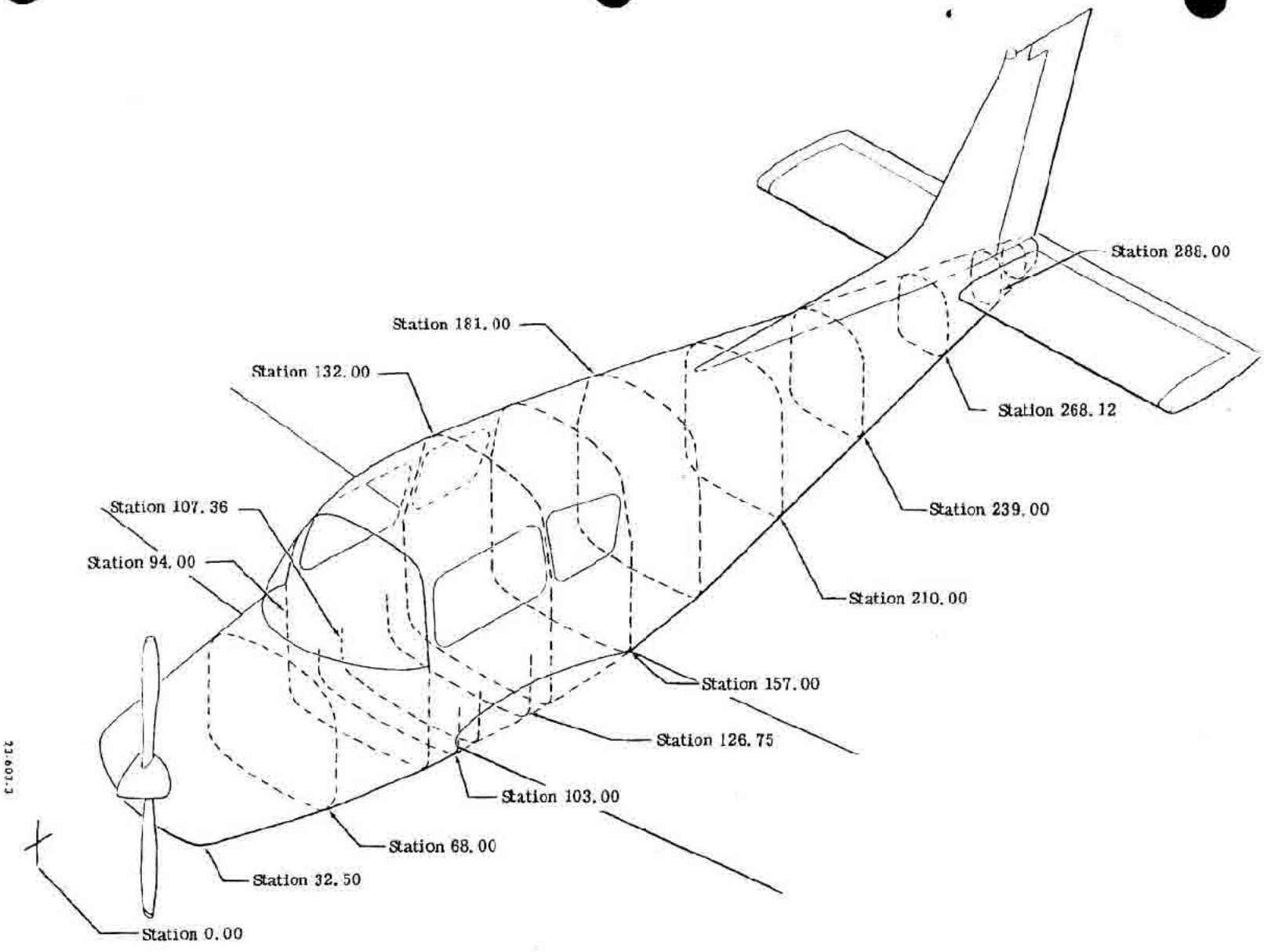

Figure 2-1. Stations Diagram

SPECIAL TOOLS

Huck Bolt Splitter	42-10
Hoisting Sling	169-590011
Stabilator Travel Board	169-620000/807 (Model 23)
Stabilator Travel Board	169-620001/807 (All Models Except Model 23)
Flap Travel Board	169-110000-1 & -2/807 (Model 23)
Flap Travel Board	169-160005/807 (All Models Except Model 23)
Aileron Travel Board	169-110000-1 & -2/807-1 (All Models)
Rudder Travel Board	169-640000-3/807 (All Models)

GROUND HANDLING

JACKING

(Figures 2-2 and 2-3)

For removing a wheel and tire from an individual gear, use a scissor jack under the wheel axle to raise airplanes without jack pads. To remove a landing gear without the aid of the jack pads (P/N 169-590014) shown in Figure 2-3, raise the wing either by the scissor jack under the axle or by manual lifting and place a contoured cradle under the wing for support. Remove the jack after the support is put in place. Lifting manually may be accomplished by two or more persons placing their shoulders under the spar. The contoured cradle should then be placed under the wing.

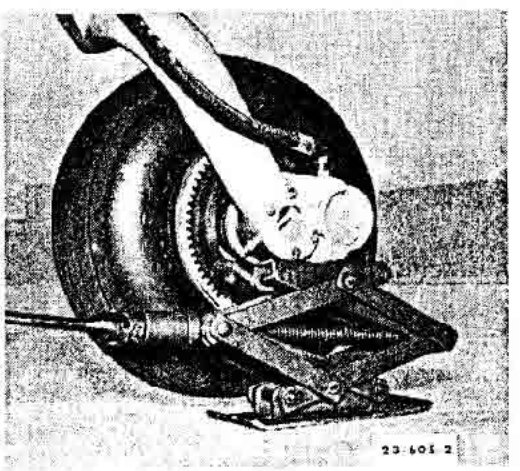

Figure 2-2. Use of Scissors Jack

The jack pads, Figure 2-3, may be installed by replacing the existing screws in the wing with longer screws (P/N NAS623-3-4). Whatever the method of jacking used, the following precautions must be observed to avoid damaging the airplane:

a. NEVER raise the airplane higher than is necessary to remove the wheel or landing gear.

b. NEVER enter the airplane while it is on jacks.

NOTE

Jack pads, on MC-2 and after, are located inboard of the main gears. Since there is not a jack point under the nose section, use of a tail stand, and the tail anchored, is required when jacking.

CAUTION

The nose gear should not be raised off the ground by placing weight on or pushing down on the stabilator. Raising the nose in the above manner may cause distortion and/or damage to the stabilator and should be avoided when ground handling the aircraft.

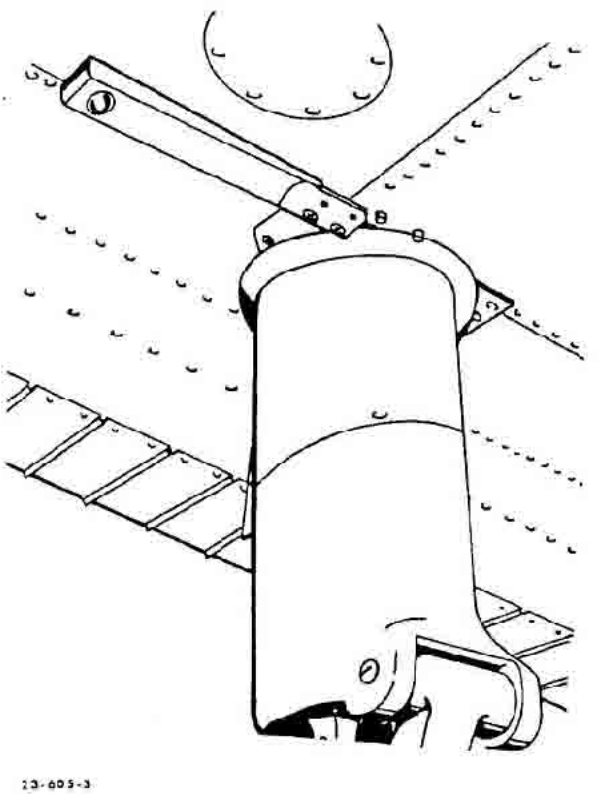

Figure 2-3. Jack Pad Installation

TOWING
(Figure 2-4)

The practical method for moving the MUSKETEER on the ground is to use the hand towbar included in the loose equipment. The towbar is installed over the two lugs on the nose gear lower torque knee. One person can maneuver the plane on level ground.

It is recommended that someone ride in the cockpit to "standby" the planes brakes when the plane is being moved across uneven or sloping ground. When a towbar is not available, pushing should be confined to the nose cowl, the cabin entry assist handle and the leading edge of the wing inboard of the main landing gear.

CAUTION

DO NOT push on the propeller or spinner or any of the control surfaces.

CAUTION

Extreme care should be used when towing the Musketeer with power equipment. Should the nose gear be turned in excess of 38° the travel stop bolt at the top of the strut may be sheared. Once the stop bolt is sheared, damage to the rudder pedal torque shafts may occur in the form of elongated holes or distorted shafts. On MUSKETEERS serials M-1035 and after, MA-213 and after, MB-245 and after and MC-2 and after, turn radius limitation stripes are installed on the nose gear housing fairing and on the nose wheel gear housing. To avoid shearing the travel stop bolt at the strut, extreme left and right travel limits are indicated when the stripes align in each direction. Do not exceed these limitations. (See Service News Vol. 20, Issue 9, for earlier airplanes.)

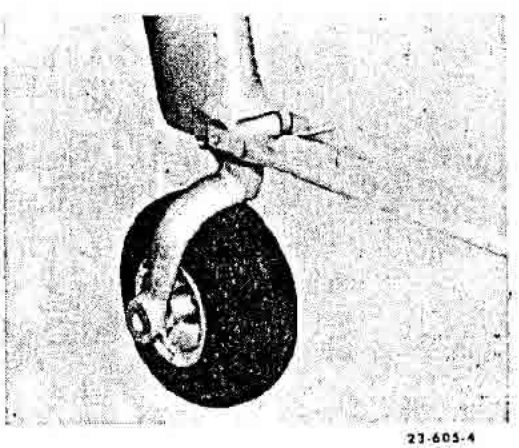

Figure 2-4. Towbar

ANCHORING

Proper tie-down of the aircraft is good insurance against damage from strong or gusty winds. A tie-down lug is located on the lower side of each wing; the tail lug serves as a third point.

After bringing the aircraft into the desired position (preferably facing into the wind) proceed as follows:

a. Chock the main wheels, fore and aft.
b. Using a nylon line or chain of sufficient strength, secure the aircraft at the wings and tail lug. DO NOT overtighten.

If a storm is anticipated, a line may be passed around the nose gear strut and each main gear strut and anchored on each side of each strut; the seat belt, prior to serials M-555, may be used to retain the control wheel full back and turned to produce full aileron. On serials M-555 and after, MA-1 and after, MB-1 and after and MC-2 and after, secure the control surfaces in neutral position (rudder excluded) with the control lock assembly furnished in the airplane loose tools and accessory kit.

CAUTION

Use of the control lock assembly on airplane serials prior to M-555 is not recommended. The ignition switch location differs on these models and protection to the ignition switch is not provided if the control lock assembly is used.

PARKING BRAKE
(M-1 thru M-1034, MA-1 thru MA-233 and MB-1 thru MB-264)

To set the parking brake, depress the pilot's toe pedals and pull out on the parking brake control, then release the toe pressure.

Release the parking brake by depressing the pilot's pedals with a hard, fast motion, then release the pressure slowly and check both wheels for free roll before applying take-off power.

(M-1035 and after, MA-234 and after, MB-265 and after, and MC-2 and after.)

To set the parking brake, pull out the parking brake control and pump the pilot's toe pedals until solid resistance is felt.

Release the parking brake by pushing the parking brake control forward. Check both wheels for free roll before applying take-off power.

SERVICING

Proper and periodic servicing of the airplane will prevent

considerable wear and greatly lengthen the service life of parts and systems involved. For points of lubrication and the correct interval and materials, refer to the Lubrication and Servicing Charts in this section. The following information gives instruction on the servicing of major systems.

FUEL SYSTEM

(Figures 2-5, 2-6, 2-7, 2-8 and 2-9)

Service the fuel tanks with the following fuel octane ratings:

M-1, M-2, M-4 thru M-554, M-1095 and after	91/96 octane - blue, 100 octane Low Lead - blue 100/130 octane - green
M-3, M-555 thru M-1094	100/130 octane - green, 100 octane Low Lead - blue
MA-1 thru MA-368	100/130 octane - green 100 octane Low Lead - blue
MB-1 and after	80/87 octane - red 100 octane Low Lead - blue
MC-2 and after	100/130 octane - green 100 octane Low Lead - blue

A fuel octane of the next higher rating may be used in each of the above categories when the required octane fuel is not available.

The fuel capacity for each of the two fuel cells, of the various airplanes is outlined below.

*M-1 thru M-1516	30 gallon (29.4 usable)
M-1517 thru M-1879 except M-1875	29 gallon (26 usable)
M-1875, M-1880 and after	29 gallon (28.4 usable)
*MA-1 thru MA-368	30 gallon (29.4 usable)
*MB-1 thru MB-654	30 gallon (29.4 usable)
MB-655 thru MB-816 except MB-814	29 gallon (26 usable)
MB-814, MB-817 and after	29 gallon (28.4 usable)
*MC-2 thru MC-150	30 gallon (29.4 usable)
MC-151 thru MC-451 except MC-449	29 gallon (26 usable)
MC-449, MC-452 and after	29 gallon (28.4 usable)

*When S. I. 0624-281 has been complied with 29 gallon (26 usable).

Each tank is located just outboard of either wing root rib. On M-1 through M-554 each tank contains a visual measuring tab in the filler neck and indicates a 20 gallon input when the fuel has reached the tab. On M-555 and after, MA-1 thru MA-368, MB-1 and after and MC-2 and after, each tank contains a visual measuring tab below the filler neck, permitting the tank to be serviced with 15 gallons or 20 gallons of fuel.

CAUTION

Fuel gages register full whenever a quantity greater than 20 gallons is in the tank. A grounding cable should be connected from the fuel nozzle to the landing gear or engine mount and to ground during fueling operations. Failure to do so creates a fire hazard.

Inspecting and cleaning the fuel strainers (wash strainers in clean solvent) should be considered of the utmost importance as a regular part of preventive maintenance. The frequency of inspecting and cleaning will depend upon service conditions and fuel handling cleanliness. However, when operating in localities where there is an excessive amount of sand or dirt, the strainers should be inspected at more frequent intervals. The following inspection and cleaning schedule is recommended for the fuel system components:

Fuel Strainers	100 hours
Carburetor Fuel Inlet Screen (M-1 thru M-554, M-1095 and after, MB-1 and after)	100 hours
Manifold Valve Screen (M-555 through M-1094)	100 hours
Fuel Injector Inlet Strainer (IO-360 engines only)	50 hours*

* Remove and clean the injector fuel inlet strainer at the first 25 hours of engine operation. For best performance of the injector system it is recommended the screen be cleaned at 50 hour intervals; however, an extended period is permissible when conditions warrant and no malfunction of the system is apparent.

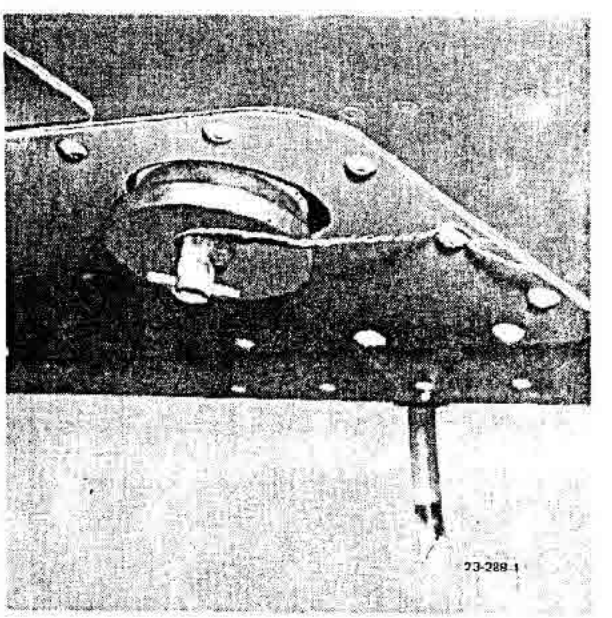

Figure 2-5. Fuel Strainer

To insure against a fuel leak developing, the fuel strainer retaining bolt should be torqued to 25 inch pounds as stamped on the strainer and safetied to the fuselage as shown in Figure 2-5. If the strainer is mounted on the firewall (M-1 thru M-175), the retaining bolt should be safetied to adjacent structure.

The fuel injector inlet strainer in IO-360 engines is located above the manual mixture control and the idle cut-off lever in the metering section of the servo regulator. Clean the strainer in solvent PD680 or equivalent. Damaged strainer "O" rings should be replaced.

CAUTION

Exercise extreme caution when working around or handling the injector. Oil or fuel entering the air sections of the injector through the impact tubes or the annular groove around the venturi will cause damage to the air diaphragm. A protective plate should be installed on the scoop mounting flange during engine wash down, or when servicing the air scoop and filter, and when injecting preservative into the engine prior to storing or shipping.

Ordinarily, the finger strainers in the fuel tank outlets should not require cleaning unless there is a definite indication of solid foreign material in the tanks, or the airplane has been stored for an extended period.

When it has been necessary to remove or replace the fuel selector valve, be certain that the pin is installed in the shaft for proper location of the handle.

NOTE

Adjustment to ensure proper function of those valves containing washers in the bottom of the valve, may be accomplished by incorporating Service Instructions No. 0181-289. For those valves that do not contain washers, it is suggested that one AN960C416 and one AN960C416L washer be installed to prevent wedging and binding, providing freedom of movement, more positive detent and proper shut off. (Reference Service Instruction No. 0364-289 Rev. H).

Many fuel system problems can be stopped before they become big ones by using a little preventive maintenance. For instance, leaks around sumps and fuel system fittings and lines can be stopped before they start by tightening the bolts to the proper torque value. Many small leaks can be stopped, also, by proper tightening of loose bolts and fittings. Torque values for flared fittings and hoses are shown in the fuel system torque chart.

As a reminder, Figure 2-6 shows the proper application of lubricant to flared fittings. Use MIL-T-5544 anti-seize graphite thread compound sparingly where lubricant is called for in the illustration. Anti-seize Compound I, made by Esso Standard Co., and Armite Product, made by Armite Laboratories in Los Angeles, California, are both satisfactory lubricants. When previously installed fittings are removed, they should be wiped clean and relubricated before they are reinstalled.

When tightening the bolts and fittings, check the gaskets too. If any of them shows sign of deterioration or evidence of leaks, they should be removed and replaced.

	WRENCH TORQUE FOR TIGHTENING AN818 NUT (POUND INCH)				HOSE END FITTING AND HOSE ASSEMBLIES (POUND INCH)	
TUBING OD INCHES	ALUMINUM - ALLOY TUBING FLARE AND10061 or AND10078		STEEL TUBING FLARE AND10061			
	MINIMUM	MAXIMUM	MINIMUM	MAXIMUM	MINIMUM	MAXIMUM
1/8	---	---	---	---	---	---
3/16	---	---	90	100	70	100
1/4	40	65	135	150	70	120
5/16	60	80	180	200	85	180
3/8	75	125	270	300	100	250
1/2	150	250	450	500	210	420
5/8	200	350	650	700	300	480
3/4	300	500	900	1000	500	850
1	500	700	1200	1400	700	1150
1-1/4	600	900	---	---	---	---
1-1/2	600	900	---	---	---	---
1-3/4	---	---	---	---	---	---
2	---	---	---	---	---	---

Fuel System Fitting Torque Values

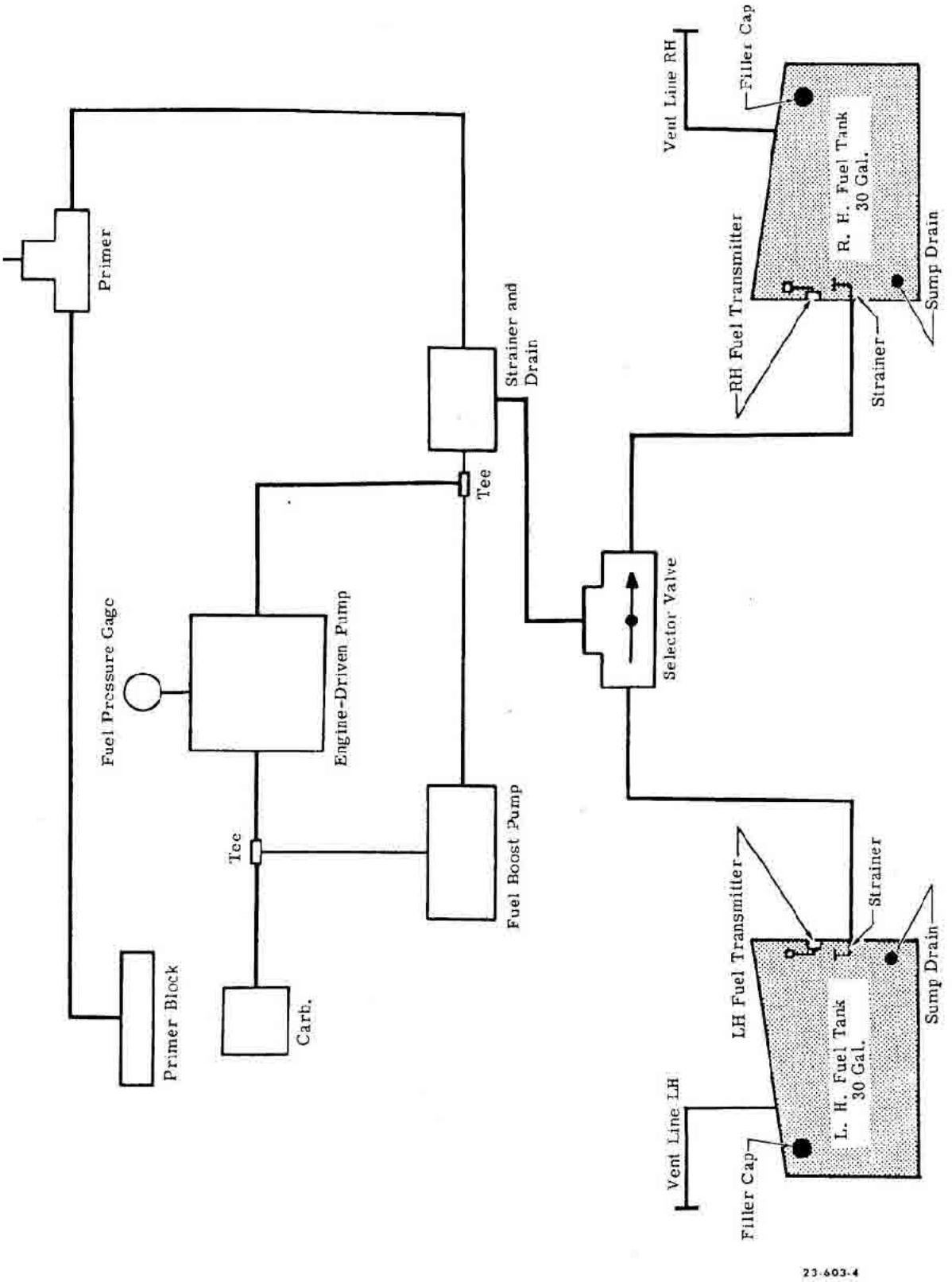

Figure 2-7. Fuel System Schematic (M-1 thru M-554, MB-1 and after and M-1095 and after)

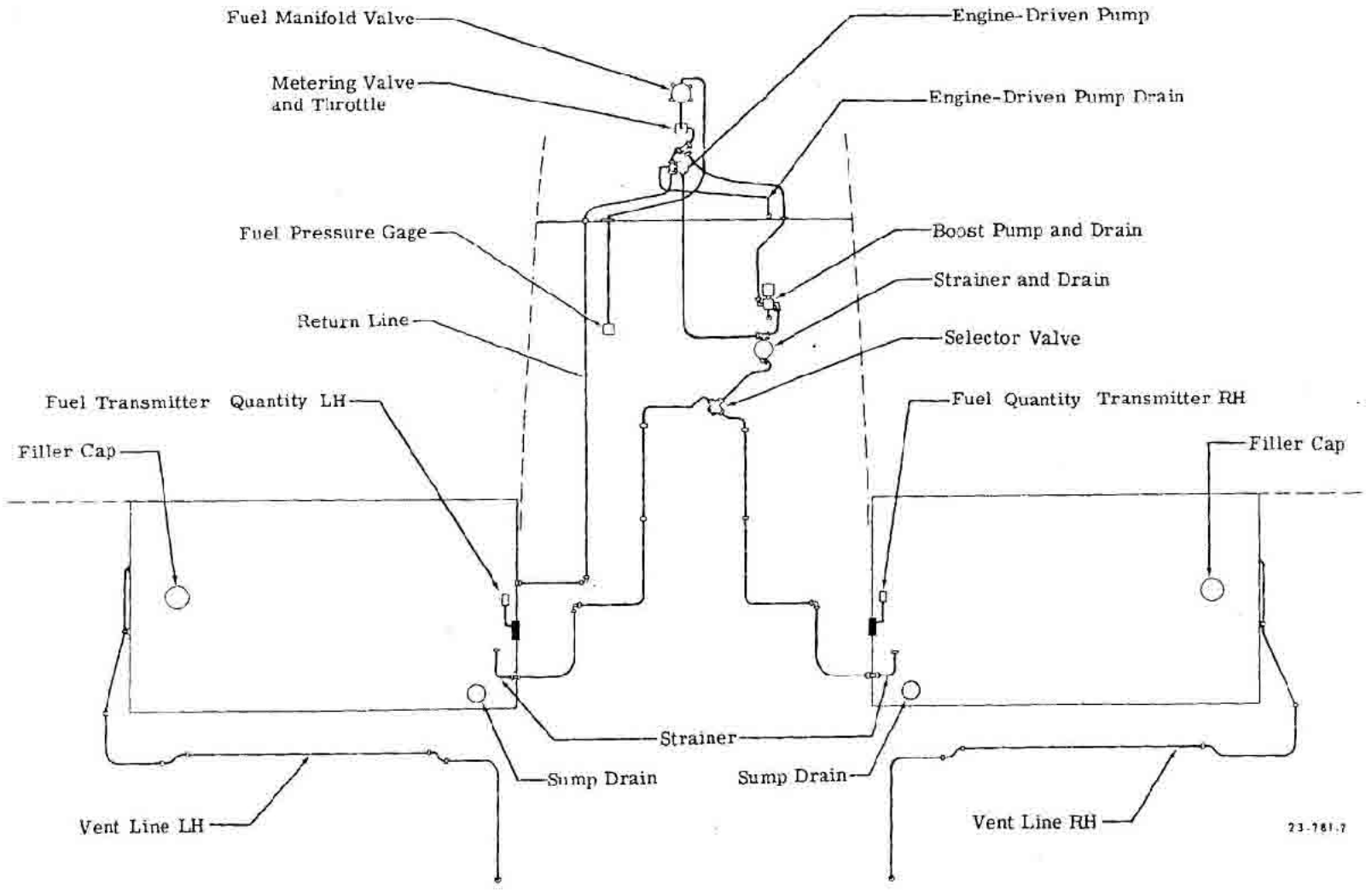

Figure 2-8. Fuel System Schematic (M-555 thru M-1094)

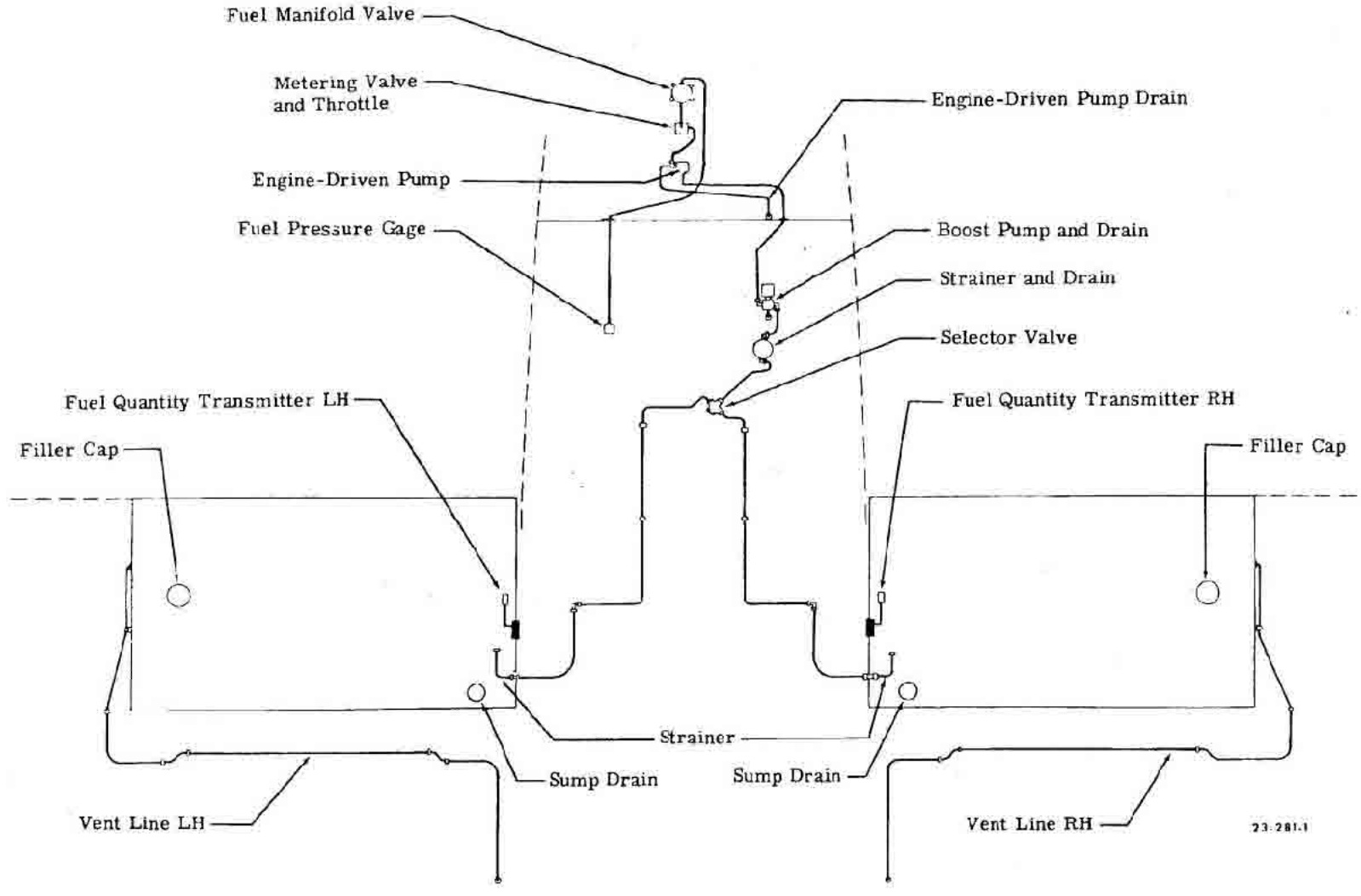

Figure 2-9. Fuel System Schematic (MA-1 and after, MC-2 and after)

OIL SYSTEM

Lycoming

The oil should be checked before flight for the required level. Under normal operating conditions the oil should be changed every 50 hours. Optional oil filters, of the full flow type with replaceable element, may be installed. The filter should be replaced every 50 hours of operation. The oil pressure screen in the oil pressure chamber, located on the accessory housing between the magnetos, and the oil suction screen, located above the oil sump drain plug, should be cleaned at each oil change. Under adverse operating conditions more frequent changes and cleaning may be required.

NOTE

To replace the element, cut the safety wire and loosen the center retaining bolt and remove the filter housing. Install the new element and gaskets furnished with the element. Tighten the retaining bolt to 240 to 260 inch pounds of torque and safety wire. Run the engine and check for leaks. One additional quart of oil is required when changing the element.

Continental

On aircraft serials M-555 through M-1094, the engine oil and oil filter element should be changed and replaced every 75 hours of operation. Oil sump capacity is 8 quarts, one additional quart is required with a filter change. (Item 1, Consumable Materials Chart).

NOTE

Aircraft equipped with replaceable element type oil filters require a torque of 180 to 216 inch pounds applied to the center stud of the oil filter when the filter element is replaced. If no torque wrench is available when the element is changed, clean and lubricate the new gasket with engine oil. Then turn the center stud of the filter by hand to light gasket contact and tighten an additional 1-3/4 turns with a suitable wrench.

Aircraft equipped with replaceable cartridge type (spin on type) oil filters require a torque of 216 to 240 inch pounds applied to the hex head nut welded to the top of the cartridge. If no torque wrench is available when the element is changed, lubricate the gasket with engine oil, and, with a suitable wrench, tighten one full turn after gasket contact.

Before draining the oil, run the engine until the oil reaches operating temperature, turn the engine off and remove the sump drain plug.

Oil grades listed in the Consumable Materials Chart are general recommendations, and will vary with individual circumstances. Check oil inlet temperature during flight in determining the use of the correct grade of oil. Inlet temperatures consistently near the maximum allowable indicate a heavier oil is needed. Use the recommended aviation grade oil in the heaviest weight that will give satisfactory starting.

BRAKES

(M-1 thru M-1034, MA-1 thru MA-233 and MB-1 thru MB-264)

The brake fluid reservoirs, an integral part of the master cylinders, located on the forward side of the rudder pedals, should be checked occasionally. Maintain fluid level one-half inch below the top of the reservoir at all times by adding hydraulic fluid (Item 7, Consumable Materials Chart).

(M-1035 and after, MA-234 and after, MB-265 and after, and MC-2 and after)

The brake fluid reservoir, located on the forward side of the firewall, should be checked occasionally. Fill to within 1-1/2 inches of the top of the reservoir and maintain a visible fluid level on the dip stick at all times by adding hydraulic fluid, (Item 7, Consumable Materials Chart).

Complete information on brake, wheel and tire maintenance is contained in Beech Aircraft Corporation Manual 98-33661 for aircraft serials prior to M-1362, MA-369, MB-522 and MC-98. For aircraft serials M-1362 and after, MB-522 and after and MC-98 and after, information contained in Beech Aircraft Corporation Manual 98-37045 should be used. The appropriate manual for your aircraft is included in the loose tools and accessories kit.

TIRES

The Musketeer, serials M-1 through M-1082, MA-1 through MA-321 and MB-1 through MB-321 are equipped with tubeless tires. Serials M-1088 and after, MA-322 and after, MB-322 and after and MC-2 and after are equipped with tube type tires

NOTE

Tube type wheels cannot be used with sidewall inflated tubeless tires.

An inflating needle kit is furnished with the loose tools and accessories kit on those aircraft equipped with tubeless tires. To inflate the tubeless tire, lubricate the inflating needle with the lubricant provided in the carrying case. Then with the end of the inflating needle, work the lubricant around the guide hole of the tire valve and insert the needle. Maintaining proper tire inflation will aid in avoiding damage from landing shock and contact with sharp

TIRES

Those aircraft, serials M-1 through M-1082, MA-1 through MA-321 and MB-1 through MB-321 are equipped with tubeless tires. Serials M-1088 and after, MA-322 thru MA-368, MB-322 and after and MC-2 and after are equipped with tube type tires.

NOTE

Tube type wheels cannot be used with sidewall inflated tubeless tires.

An inflating needle kit is furnished with the loose tools and accessories kit or those aircraft equipped with tubeless tires. To inflate the tubeless tire, lubricate the inflating needle with the lubricant provided in the carrying case. Then with the end of the inflating needle, work the lubricant around the guide hole of the tire valve and insert the needle. Maintaining proper tire inflation will aid in avoiding damage from landing shock and contact with sharp stones and ruts, and will minimize tread wear. When inflating tires, inspect them visually for cracks, breaks or evidence of internal damage.

CAUTION

Never force the needle into a dry valve. If it will not enter easily, relubricate the needle and valve.

NOTE

Beech Aircraft Corporation cannot recommend the use of recapped tires on the MC-2 and after. Recapped tires have a tendency to swell as a result of the increased temperature generated during takeoff. Increased tire size can jeopardize proper function of the landing gear retract system, with the possibility of damage to the landing gear and retract mechanism.

RECOMMENDED TIRE PRESSURES

STANDARD		
Aircraft	Nose 15 X 6.00-6	Main 15 X 6.00-6
23, A23, A23A, 19, 19A, B23, C23, B19	40 psi	40 psi
24, A24	60 psi	60 psi
A24R, B24R, C24R	14.20 X 5.00-5 35 psi	17.50 X 6.00-6 32 psi

OPTIONAL		
Aircraft	Nose 17.50 X 6.00-6	Main 17.50 X 6.00-6
23, A23, A23A, 19, 19A, B23, C23, B19	20 to 22 psi	20 to 22 psi
24, A24, B24R, C24R	26 to 30 psi	26 to 30 psi

CONVERTING WHEELS TO USE TUBE TYPE TIRES

(Figure 2-10)

Those aircraft equipped with tubeless tires may be converted to use tube type tires as follows:

a. Drill a 1/2 inch diameter hole, (see figure 2-10), in both outboard wheel halves of the main wheels and the left wheel half of the nose wheel.

b. Drill a No. 27 (.144 inch) hole, (See Figure 2-10), and install a clip (P/N 952449[illegible]) with an AN504-8R8 self-tapping screw.

c. After drilling and chamfering the wheel halves, paint the machined areas with two coats of zinc chromate primer followed by two coats of aluminum lacquer.

d. With the conversion completed, stamp an "R" in 1/8 inch characters behind both the wheel half subassembly and the main part number before reassembling the wheel to show that the wheel has been modified.

REPLACING GOODYEAR WHEELS AND BRAKES WITH CLEVELAND WHEELS AND BRAKES

Goodyear wheels and brakes may be replaced with Cleveland wheels and brakes, however the Cleveland wheels require additional spacers and washers as shown in the Parts Catalog P/N 169-590012F or subsequent.

LANDING GEAR

LANDING GEAR GREASE FITTINGS

The landing gear knee pins on aircraft serials MA-1 through MA-368, MB-1 and after, MC-2 through MC-179, M-1 through M-554 which have been modified to incorporate the larger knee pins and M-555 and after should be greased at each 25 hours of operation, or more often, with Aero Lubriplate grease (product of BRC Bearing Company, Wichita, Kansas) item 5, Consumable Materials Chart.

On serials MC-2 through MC-179, except those aircraft which have complied with Service Instructions No. 0620-204, the main gear door attaching bolt should be removed to provide a means of lubricating the landing gear knee pin from the inboard side, thus ensuring complete lubrication of the knee pins.

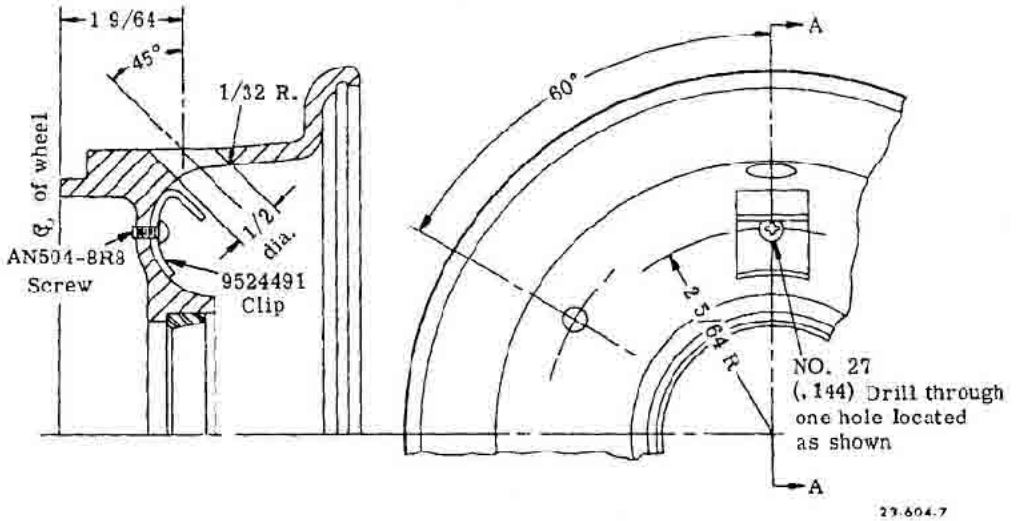

Figure 2-10. Wheel Conversion

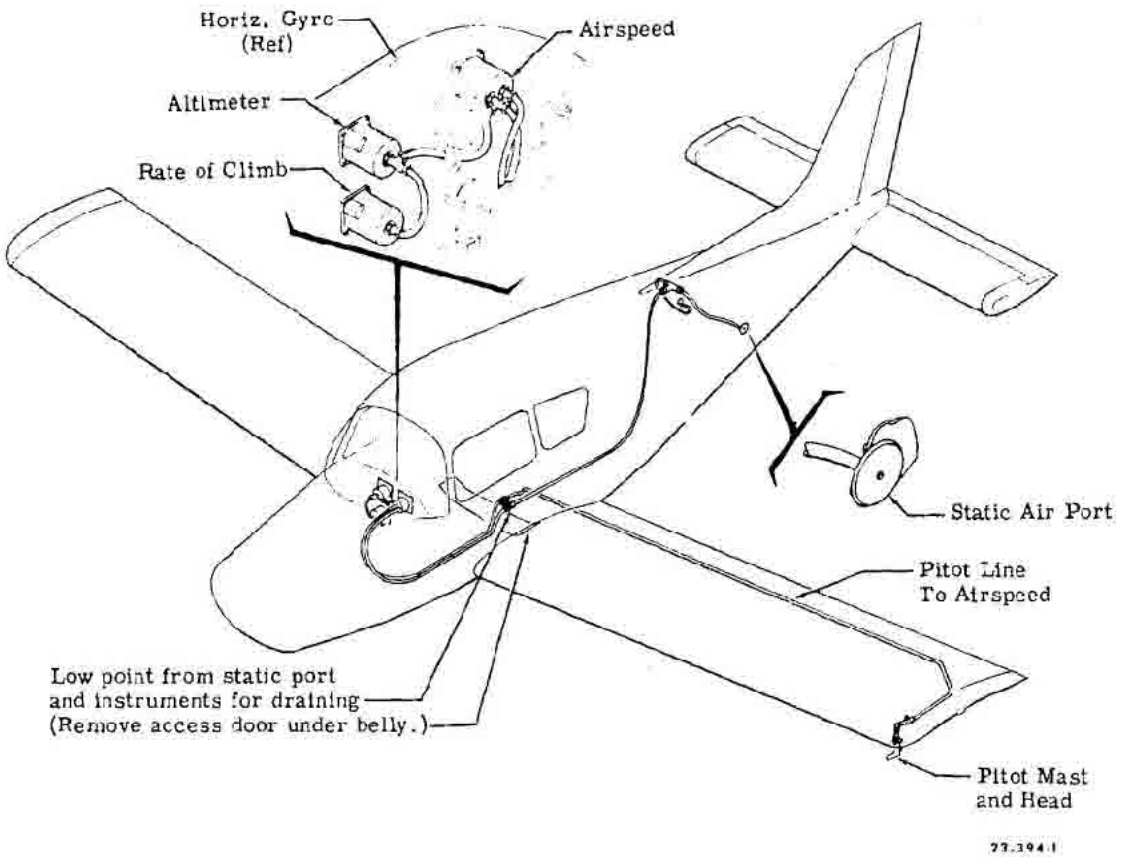

Figure 2-11. Pitot and Static Air System

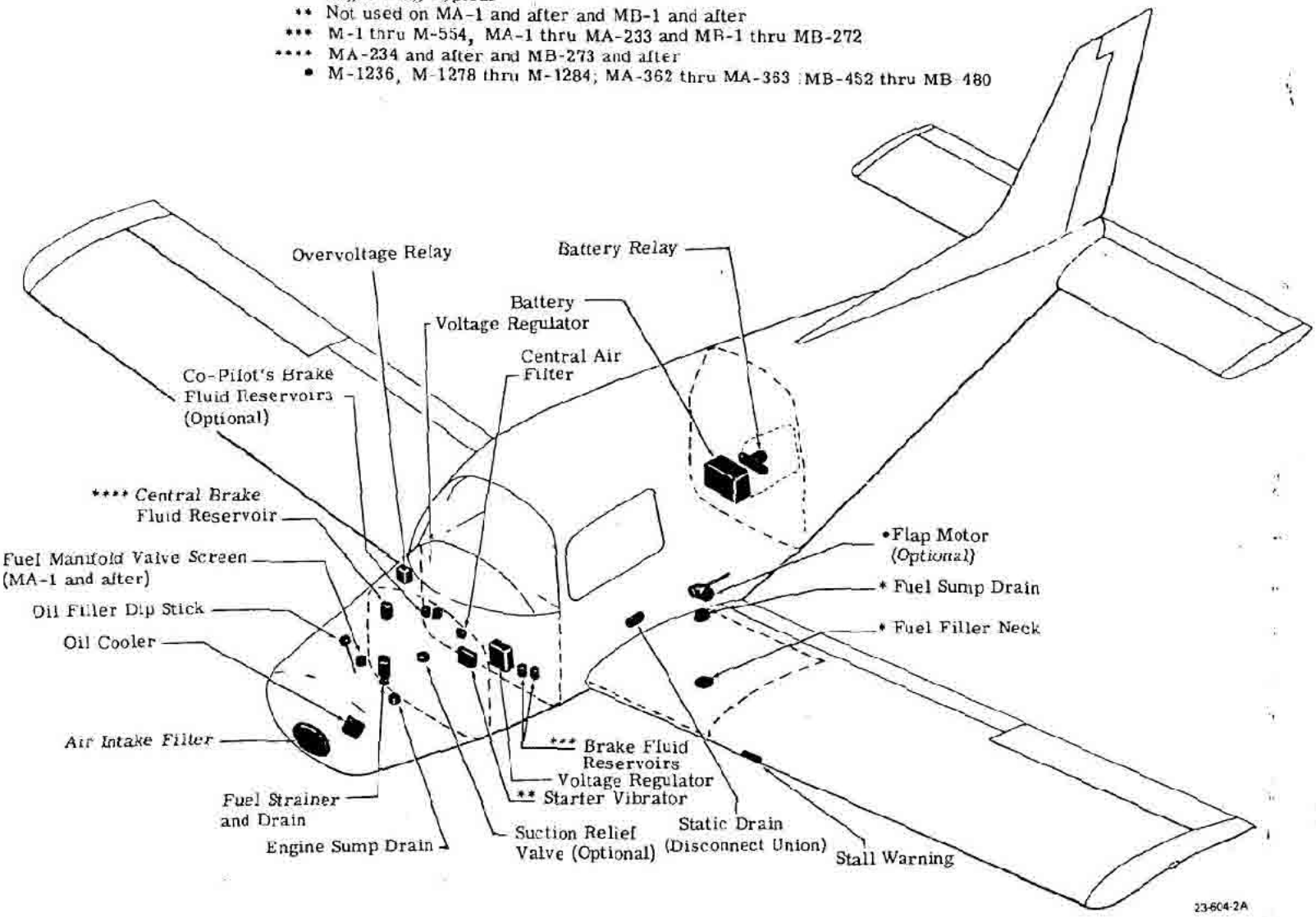

Figure 2-12. Servicing Points Diagram (M-1 thru M-554, M-1095 thru M-1284, MA-1 thru MA-363, MB-1 thru MB-480)

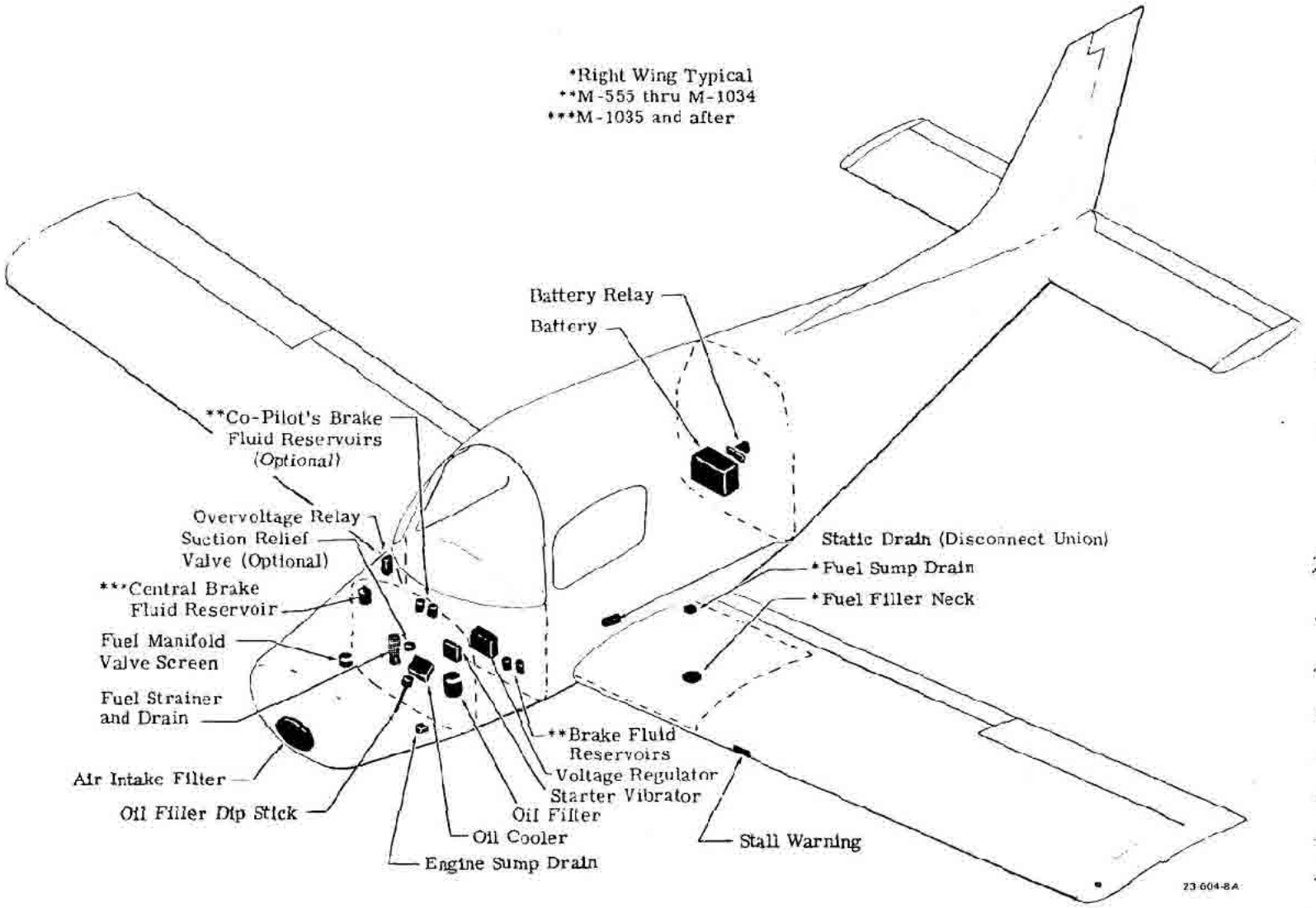

Figure 2-13. Servicing Points Diagram (M-555 thru M-1094)

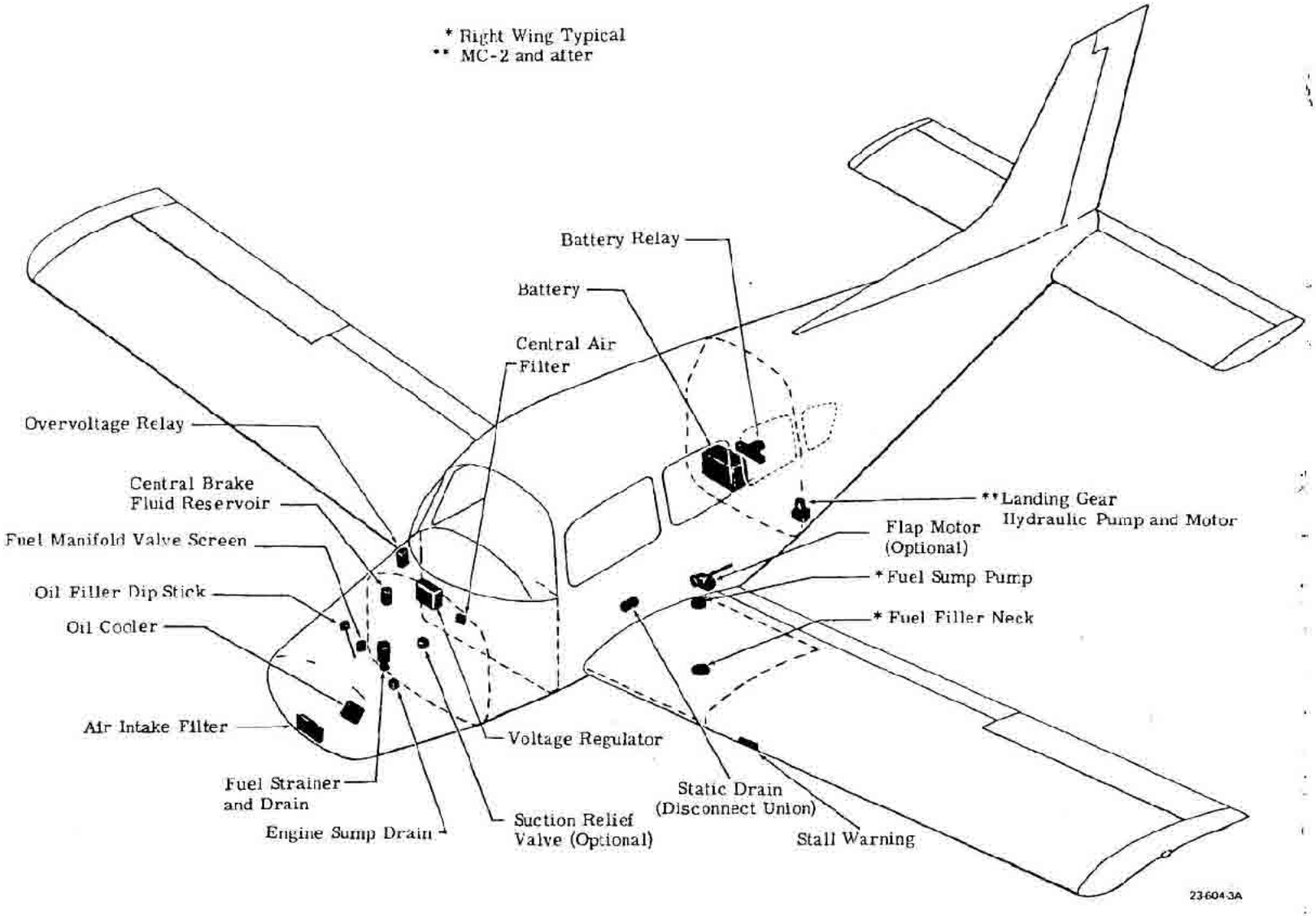

Figure 2-14. Servicing Points Diagram
(M-1285 and after, MA-364 and after, MB-481 and after, MC-2 and after)

The static air buttons should be cleaned periodically with a cleaning solution to insure that no film exists on the buttons.

NOTE

Wax or polish applied to the static air buttons may result in incorrect instrument readings.

Before clearing the pitot tube of obstructions be sure to disconnect the line at the low point. Do not blow toward the instruments until instruments are disconnected.

BATTERY

A 12-volt, 25 amp-hour, or a 12-volt, 35 amp-hour battery is installed directly aft of the baggage compartment and may be reached through the rear panel.

The battery should be checked regularly for fluid level, and distilled water added as required. Clean tight connections should be maintained at all times. Battery vents should be checked periodically for obstructions and for proper protrusion (1 to 3 inches from top of chamfer to skin line). Since either vent may serve as the intake, one chamfer should be forward and the other aft.

When recharging the battery, commence with a charging rate of 4 amps and reduce to 2 amps at the close of the charging cycle. When applying a quick charge, the battery master switch must be in the OFF position.

EXTERNAL POWER

To supply power for ground checks or to assist in starting use only an auxiliary power source that is negatively grounded.

Before connecting an auxiliary power unit, turn off all radio equipment, the generator or alternator switch, and the battery switch. After the external power is connected, turn on the battery switch before turning on any other equipment. Leave the battery on during the entire external power operation.

CAUTION

Aircraft components may be damaged if exposed to voltages higher than 15 volts or if external power is connected with reversed polarity.

VACUUM SYSTEM
(Figure 2-15)

To adjust the suction relief valve, located forward of the instrument panel on the upper aft side of the firewall, start the engine and maintain 2000 rpm. The adjusting screw is turned clockwise to increase suction. Adjust to read 4.8 inches Hg for 5 inch gyros or 5.0 - 5.1 for 3 inch gyros.

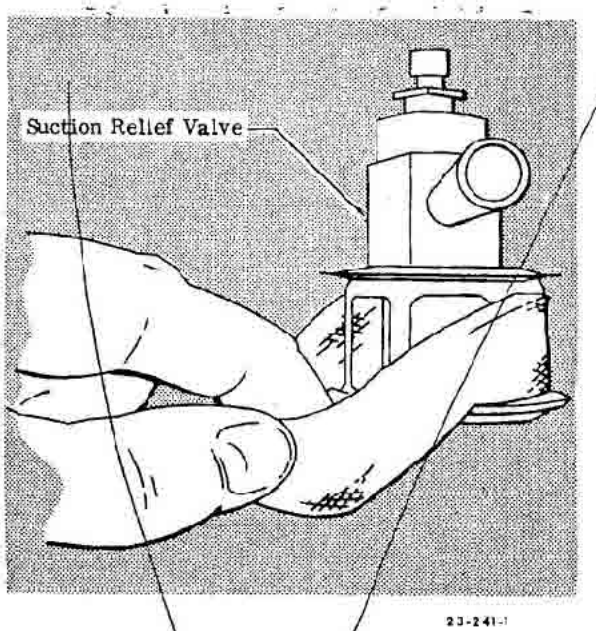

Figure 2-15. Cleaning Suction Relief Valve

The foam rubber suction relief valve filter may be removed for cleaning by slipping it off the bottom of the valve (as shown in the illustration). The screen may be cleaned with soap and water.

A central filter for the vacuum system is mounted on the aft side of the firewall behind the pilot's instrument panel on M-1069 and after, MA-273 and after, MB-289 and after, and MC-2 and after. This filter has a disposable element that should be replaced at 300 to 500 hour intervals, or oftener if conditions warrant. The filters of 5-inch gyros should also be removed and cleaned at 300 to 500 hour intervals, or oftener if conditions warrant.

ENGINE AIR INTAKE FILTER
(Figure 2-16)

The air filter is located in the nose cowling and should be inspected every 25 to 50 hours for accumulated foreign matter.

To remove the filter for cleaning, loosen the two wing nuts holding the filter plate in place and lift the filter out.

The filter may be cleaned by shaking or tapping gently to dislodge foreign matter. Replacement is recommended at 300 hours for normal operation and more frequently should conditions warrant.

Filter removal and cleaning on M-1285 and after, MA-364 and after, MB-481 and after and MC-2 and after may be accomplished as follows

CAUTION

Airplane components may be damaged if exposed to voltages higher than 15 volts or if external power is connected with reversed polarity.

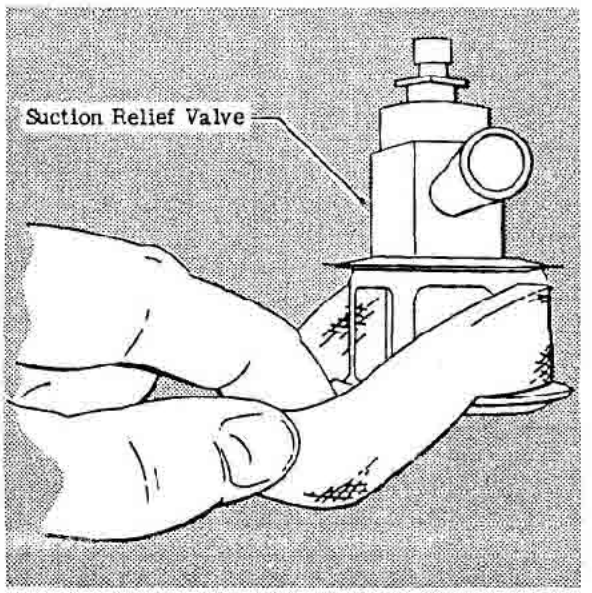

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Figure 2-15. Cleaning Suction Relief Valve

VACUUM SYSTEM
(Figure 2-15)

To adjust the suction relief valve, located forward of the instrument panel on the upper aft side of the firewall, start the engine and maintain 2000 rpm. The adjusting screw is turned clockwise to increase suction. Adjust to read 4.8 inches Hg for 5 inch gyros or 5.0 - 5.1 for 3 inch gyros.

The foam rubber suction relief valve filter may be removed for cleaning by slipping it off the bottom of the valve (as shown in the illustration). The screen may be cleaned with soap and water.

A central filter for the vacuum system is mounted on the aft side of the firewall behind the pilot's instrument panel on M-1069 and after, MA-273 through MA-368, MB-289 and after, and MC-2 and after. This filter has a disposable element that should be replaced at 300 to 500 hour intervals, or oftener if conditions warrant. The filters of 5-inch gyros should also be removed and cleaned at 300 to 500 hour intervals, or oftener if conditions warrant.

ENGINE AIR INTAKE FILTER
(Figure 2-16)

The air filter is located in the nose cowling and should be inspected every 25 to 50 hours for accumulated foreign matter.

To remove the filter for cleaning, loosen the two wing nuts holding the filter plate in place and lift the filter out.

The filter may be cleaned by shaking or tapping gently to dislodge foreign matter. Replacement is recommended at 300 hours for normal operation and more frequently should conditions warrant.

Filter removal and cleaning on M-1285 and after, MA-364 through MA-368, MB-481 and after and MC-2 and after may be accomplished as follows:

WARNING

Make sure that the filter on MC-2 and after and on MA-364 through MA-368, is properly drained prior to installation. This must be done to prevent oil from the filter from entering the air section of the injector and causing deterioration of the diaphragm.

APPROVED SPARK PLUGS

Correct Torque For All Spark Plugs Used In Lycoming Engines Is 360 to 420 in. lbs.

Correct Torque For All Spark Plugs Used In Continental Engines Is 320 to 380 in. lbs.

SPARK PLUG MANUFACTURER AND TYPE					
		CHAMPION	GAP	AC	GAP
23 Engine:	O-320-D2B (Lyc.)	REM-40E REM-38P	.018 to .022	SR-83P*	.015 to .018
A23 & A23A Engine:	IO-346-A (Cont.)	RHM-40E REM-38E	.018 to .022	HSR-87 HSR-83P*	.018 to .022
A23-19, 19A & B19 Engine:	O-320-E2B (Lyc.) O-320-E2C O-320-E2E O-320-E3D	EM-41E	.018 to .022	SR-87 SR-88	.018 to .022
B23 & C23 Engine:	O-360-A2G (Lyc.) O-360-A4G O-360-A4J	REM-40E	.018 to .022	SR-83P*	.015 to .018
A23-24, A24, A24R, B24R & C24R Engine:	IO-360-A1B (Lyc.) IO-360-A2B IO-360-A1D IO-360-A1B6	REM-38E	.018 to .022	SR-86 SR-83P*	.015 to .018

*Spark Plugs with platinum electrodes.

NOTE

Wide gap spark plugs will improve idle characteristics and reduce magneto drop-off. However, spark plugs must be serviced at more frequent intervals.

a. Remove the filter by removing the two Phillips screws in the top center and bottom center of the filter.
b. Clean the filter thoroughly with solvent.
c. Dip in SAE 10 or 20 oil and allow to drain for 2 to 4 hours.
d. Reinstall the filter.

NOTE

Failure to tighten the screws attaching the filter to the cowling or fuel injector air box may result in the filter gasket being sucked into the induction air system, resulting in a reduction of engine power. Also the filter must be installed with the proper direction of air flow as shown on the side of the filter.

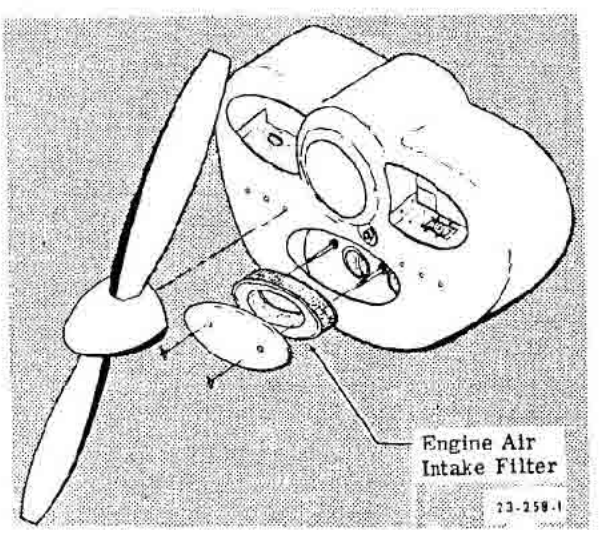


Figure 2-16. Cleaning Engine Air Intake Filter (Prior to M-1285, MA-364, MB-481)

HEATING AND VENTILATION SYSTEM

CABIN HEATING

Hot air for warming the cabin and defrosting the windshield is picked up through an intake on the forward engine baffle. The air passes through the heater muffler and into a mixer box where it is blended with cold air to obtain the desired cabin temperature. Pull out the CABIN HEAT knob for heat and push the knob in for fresh air. The knob marked CABIN AIR regulates the quantity of air entering the cabin through the firewall outlet. Pull out the DEFROST knob for maximum defrost.

On M-1586, M-1600 and after; MB-716, MB-731 and after; MC-293, MC-305 and after there are heated air outlets on each side of the pedestal and optional outlets above the floor for each passenger.

VENTILATION SYSTEM

(Prior to M-1880 except M-1875, MA-1 through MA-368, prior to MB-817 except MB-814, prior to MC-452 except MC-311 and MC-449)

Fresh air for the cabin enters two grill type vents immediately forward of the windshield. The air is ducted to the outlets, one on either side of the instrument panel and overhead outlets for each passenger. The flow of air is controlled by the rotation of these outlets.

VENTILATION SYSTEM

(M-1875, M-1880 and after; MB-814, MB-817 and after; MC-311, MC-449, MC-452 and after)

Fresh air is provided for the cabin by an air intake, located on the left side of the dorsal fin. The air is then ducted to individual outlets above each seat. The flow of air is controlled by the rotation of these outlets. Two additional outlets, located on each side and aft of the instrument panel, are also provided. Fresh air for the instrument panel outlets enters two grill type vents, located immediately forward of the windshield. Rotation of the instrument panel outlets controls the flow of air. Fresh air also enters from an intake on the forward engine baffle and enters the cabin from outlets on the pedestal.

The optional fresh air blower, is located in the aft fuselage between fuselage stations 210 and 216. It is designed primarily for ground operation, but may be operated at any time. The blower supplies air only to the overhead outlets. The circuit breaker swich is located on the pedestal below the engine controls, and placarded CABIN AIR BLOWER, ON OFF.

INSPECTION OF HEATING AND VENTILATION SYSTEM

Inspect the air intake, located on the forward engine baffle. All connections and clamps should be checked for tightness and the air intake for holes and cracks. If the optional blower is installed check to ensure that the wires of the blower motor (particularly the ground wire) are making an effective connection.

Inspect the mixer box and the condition of the air ducts leading to the windshield defroster and cabin heat outlets. Seal or tape openings around wires, tubes or cables passing through the firewall.

HEATER MUFFLER INSPECTION

It is recommended that at each 100 hour and/or annual inspection, all exhaust muffler shrouds be removed and the muffler throughly inspected for cracks, leaks and (if applicable) deterioration of the internal tubes which could cause a decrease in engine power due to blockage of the exhaust. Inspection of the heater muffler may be accomplished as follows.

a. The heater muffler should be pressurized to approximately 15 psig and either immersed in water or "painted" with soap solution. If any leaks are apparent, the heater muffler must be replaced. Carbon monoxide gas could be introduced into the heater system by leaks, therefore replacement is required.

On those airplanes originally equipped with Elano exhaust systems (listed below) it is possible to inspect the internal baffles through the exhaust outlet stack using a one inch diameter (or smaller) long handled inspection mirror and a gooseneck flashlight.

ELANO EXHAUST SYSTEMS

Part Number	Nomenclature	Effective
099001-009	Exhaust Assy	M-1143, M-1155, M-1235 thru M-1289
099001-016	Exhaust Assy	M-1290 thru M-1292
099001-020	Exhaust Assy	M-1293 and after
099001-008	Exhaust Assy	MB-481 thru MB-488
099001-019	Exhaust Assy	MB-489 and after
099001-012	Exhaust Assy	MA-341 thru MA-367, except MA-344
099001-018	Exhaust Assy	MA-368 only, MC-12 thru MC-27
099001-023	Exhaust Assy	MC-28 and after

GYRO INSTRUMENT AIR FILTER

On early aircraft that do not have the gyro instrument central air filter kit installed, clean the instrument air filter approximately every 50 hours of operation, more often under extreme dust conditions. Filters are removed by removing the air filter body-cover and taking out the four fillisterhead machine screws. Lift out the snap ring which holds the filter in place, remove the filter. If the air filter body-cover is not used, the filter may be removed by lifting the snap ring past the four protective lugs.

On airplanes with Gyro Instrument Central Air Filter Kit 95-5001 installed, the filter should be replaced every 300 to 500 hours or as conditions warrant.

NOTE

Cleaning the instrument air filter is not required when the central air filter is installed.

PRESERVATION OF RUBBER SEALS

Coat the baggage door seal with a silicone spray (Krylon No. 1325 or 1329) as required to prevent leakage around the seal.

To prevent deterioration of the seals around the doors and cowling, coat them with Oakite 5 compound. No special care is required when applying the compound to keep it from coming in contact with any painted surfaces. The compound is noninjurious to paint and may be removed by employing normal cleaning methods.

PRESERVATION OF ENGINE MOUNTS

To protect the rubber surface of Lord engine mounts from minor deterioration due to the effects of ozone, treat the mount biscuits with a silicone grease or a silicone spary such as Krylon No. 1325 or No. 1329. Such treatment of the mounts is recommended at the date of the next annual inspection, and annually thereafter. In locales with exceptional ozone content in the air, the mounts may require more frequent treatment.

ENGINE CLEANING

Engine cleaning, serials M-1 through M-1094, must be exercised with care. Do not allow water or cleaning solvents to contact the starter vibrator. The starter vibrator should be covered with a moisture proof material (plastic bag or equivalent). Moisture in the vibrator may cause the vibrator to fail and thus prevent the engine from starting. On serials MA-1 through MA-368, MB-1 and after, M-1095 and after and MC-2 and after, the starter vibrator is not used in the ignition system.

NOTE

It is recommended that the nose gear pivot bearings be lubricated after the engine has been washed down. If any of the cleaning solvent used to wash the engine gets into this area, it will wash the lubricant out of the pivot bearings.

EXTERIOR CLEANING

High gloss lacquer is used for the exterior painted surfaces. Do not wax or polish the aircraft for a period of 60 to 90 days after delivery, as the new paint requires this time to cure properly. Should it become necessary to clean the painted surface before the curing time has elapsed, use lukewarm water and mild soap. Rub down with a chamois or soft cloth.

CAUTION

Never clean the exterior with detergents or harsh alkali.

Keep the static buttons covered when washing or waxing. A good automotive polish or equivalent may be used on painted surfaces.

INTERIOR CLEANING

Vacuum clean the seats, rug, upholstery panels, and headlining frequently to remove as much surface dirt and dust as possible. When it is necessary to remove stains, spots, etc., use a commercial foam type cleaner. When using cleaners of this type, follow the recommendations as noted and approved on the container.

Some interior trim may be affected by the ultra-violet rays of the sun over a period of time. The results of this exposure is a yellow stain that accumulates on the plastic. This stain may be removed with an abrasive cleaner such as comet, and a wet cloth. Care must be exercised during this cleaning operation or damage to the upholstery will result due to the high bleach content of this type cleaner. Any other cleaning of the interior trim may be accomplished using soap and water or isopropyl alcohol.

CAUTION

The interior cabin trim may be easily contaminated if cleaned with methyl ethyl keytone, naphtha, Mufti, standard solvent, gasoline, lacquer thinner and other types of thinners. Sharp edges or cuts on the edge of the interior trim material may cause it to crack.

PLASTIC WINDOW CLEANING

Care should be taken when cleaning plexiglass windows as they are easily scratched. Never wipe the windows when dry. Clean water or a mild soap solution will remove ordinary film. Trisodium phosphate completely dissolved in water will remove oil and grease. For stubborn spots, hexane, aliphatic naphtha or menthanol may be used. For best results, use a soft flannel cloth with a good anti-static plexiglass cleaner to wash the windows. Avoid prolonged rubbing.

NOTE

Do not use gasoline, benzine, acetone, carbon tetrachloride, fire extinguisher fluid, deicing fluid, or lacquer thinners on plexiglass as they have a tendency to soften and craze the surface.

PAINT FINISHES

The following list is to be used as a reference should it become necessary to touch up or match an interior or exterior finish. Each paint is listed according to its use and specific type.

MODEL 23

LACQUER (Exterior Colors)	PART NUMBER
Toreador Red	118684-49
Black	118684-55
White	118684-57
Beaver Brown	118684-59
Castle Tan	118684-61
Pacific Blue	118684-157
Blueberry Blue	118684-159
Gold	118684-161

LACQUER (Interior Colors)	PART NUMBER
Dull Black	118684-133
Autumn Smoke	118684-155
Cloud Gray	118684-0

ENAMEL (Interior Colors)

Insignia Red	118684-27
Black (Baking Enamel)	94-515

VINYL (Interior Colors)

Autumn Smoke	118684-255

MODEL A23, A23A, 19, 19A, 24, B23, C23, B19, A24, A24R, B24R C24R

LACQUER (Exterior Colors)	PART NUMBER
BLUE	
Alpine Blue	118684-63
Biscayne Blue	118684-263
Crater Blue	118684-553
Marlin Blue	118684-545
Pacific Blue	118684-157
Sea Blue	118684-331
TURQUOISE	
Turquoise	118684-51
GREEN	
Jade Mist Green	118684-547
Olive Green	118684-559
YELLOW	
Bright Gold	118684-555
Jubilee Gold (Stripe Only)	118684-259
Mesa Gold	118684-557
ORANGE	
Bittersweet	118684-261
International Orange	118684-297
RED	
Really Red	118684-571
Toreador Red	118684 49
Vendetta Red	118684-551
BROWN	
Sable Brown	118684-257
BLACK	
Black	118684-55
WHITE	
Matterhorn White	118684-57

LACQUER (Interior Colors)	PART NUMBER
Autumn Smoke	118684-155

SPECIAL PAINTS (Interior Colors)	PART NUMBER
Door Frames	
White	118686-217
Instrument Panel and Map Case Door	
*Desert Beige	202-J11
**Autumn Smoke	118684-155
***Tan	27SG-26814
Subpanel	
****Metallic Brown	202-J12
***Brown	27SG-26815
Instrument Black	ANA514

*M-555 thru M-962, MB-1 thru MB-44, MA-1 thru MA-20

**M-963 thru M-974, MB-45 thru MB-89, MA-21 thru MA-64

***M-975 and after, MB-90 and after, MA-65 thru MA-368

****M-555 thru M-974, MB-1 thru MB-89, MA-1 thru MA-64
M-1059 and after, MB-265 and after, MA-292 thru MA-368

URETHANE (Exterior Colors)	PART NUMBER
BLACK	
Black	118684-319
BLUE	
Crater Blue	118684-529
Marlin Blue	118684-393
GREEN	
Jade Mist Green	118684-359
Olive Green	118684-541
BROWN	
Sable Brown	118684-320
RED	
Really Red	118684-523
Toreador Red	118684-316
Vendetta Red	118684-525
WHITE	
Matterhorn White	118684-318
GOLD	
Bright Gold	118684-531
Mesa Gold	118684-535
MODIFIED URETHANE:	
Matterhorn White	118684-609
Black	118684-611
Sable Brown	118684-613
Olive Green	118684-629
Jade Mist Green	118684-617
Really Red	118684-619
Vendetta Red	118684-621
Toreador Red	118684-631
Marlin Blue	118684-615
Aristo Blue	118684-633
Crater Blue	118684-623
Mesa Gold	118684-609
Bright Metallic Gold	118684-625
Citrus Green	118684-661
Beechwood Green	118684-647
Yellow Jacket	118684-663
Champagne Gold	118684-639

BULB REPLACEMENT GUIDE

LOCATION	BULB NUMBER
Wing Navigation Lights	1512
Tail Light	93
Landing Light	4313
Cabin Dome Light	89
Overhead Instrument Light	89
Post Light	330
Compass Light	330
Engine Instrument Cluster Light	*53, **330R
Rotating Beacon	WRM-44KA
Simulated Landing Gear Position Light	330
Taxi Light	4595
Strobe Light Assembly (White/Red)	30-0538-1
Strobe Light Assembly (White/Green)	30-0538-2
Strobe Light Lamp	A7512-12
Strobe Light Flashtube	31-2059-1

*M-1 thru M-554
**M-555 & after, MA-1 thru MA-368, MB-1 & after

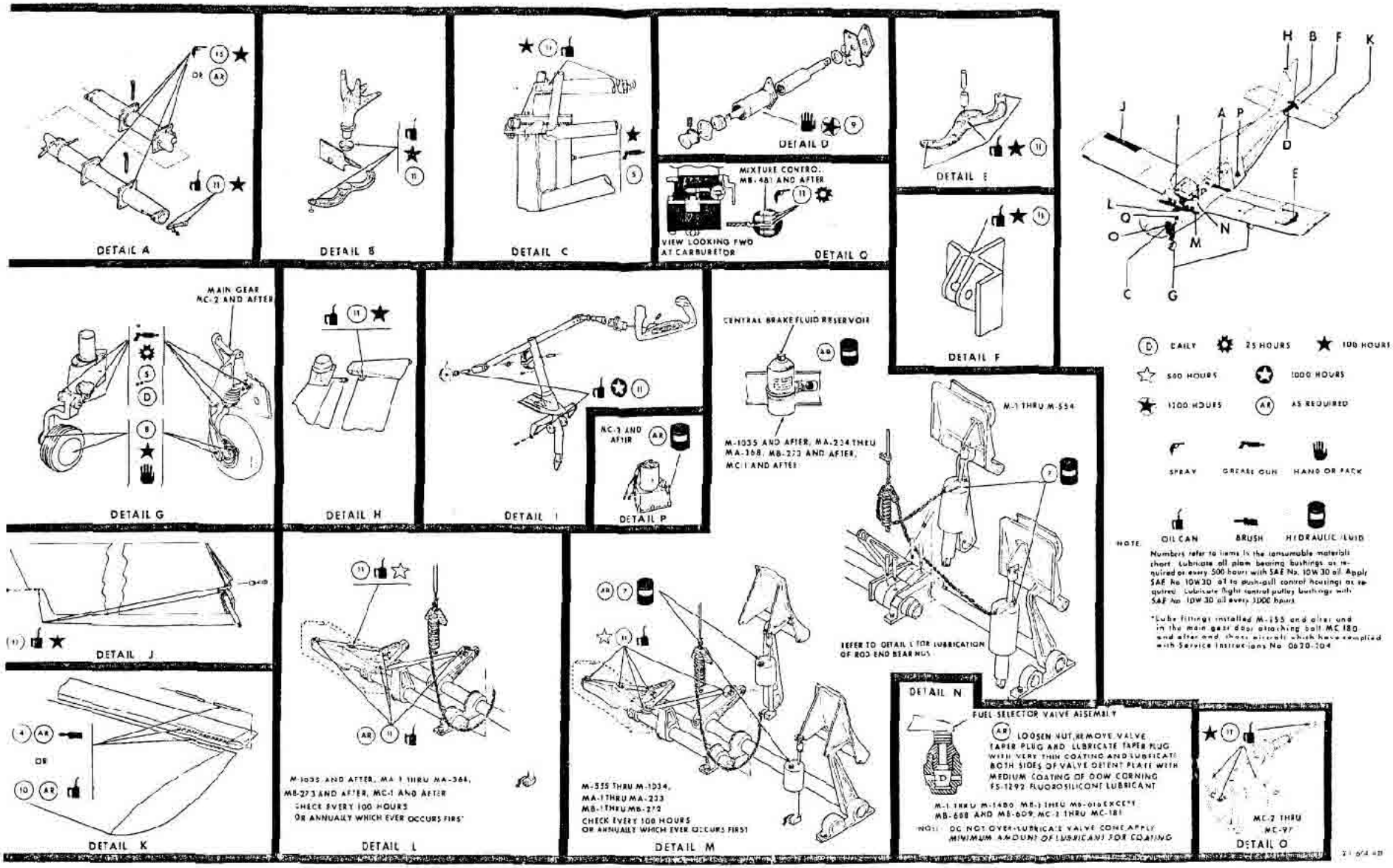


Figure 2-17. Lubrication Diagram

ITEM	NOMENCLATURE	SPECIFICATION	EQUIVALENT COM'L PRODUCT AND VENDOR
1.	Engine oil (Continental Engine)	SAE No. 30 (Below 40°F.) SAE No. 50 (Above 40°F.)	
	Engine Oil (Lycoming Engine)	SAE No. 10W/30 (below 10°F.) SAE No. 30 (0° to 70°F.) SAE No. 40 (30° to 90°F.) SAE No. 50 (Above 60°F.)	

Serials M-555 through M-1094 use only aviation grade oil after the first 20 to 30 hours operation that conform to Continental Motors Specification MHS-24A. Straight Mineral Oil can be used for first oil change period of 20 to 30 hours.

Approved engine oils that meet the requirements of Continental Motors Corporation Specification MHS-24A and AVCO Lycoming Specification 301E and/or Lycoming Service Instructions No. 1014E are listed in the APPROVED ENGINE OILS in this section.

2.	Solvent	PD680	Sherwood and Co., Wichita, Kansas
*3.	Fuel, Engine	80/87 Octane (MB-1 and after) 100/130 Octane (M-1 and after) 91/96 Octane may be used per Lycoming Service Instruction L169A 100/130 Octane (MA-1 and after and MC-2 and after)	
**4.	Lubricant, Powdered Graphite	MIL-G-6711	GP-38, National Carbon Co., N.Y., N.Y.
5.	Grease (High & Low Temperature)	Aero Lubriplate 630	BRC Bearing Co., Wichita, Kansas Lubriplate Div. of Fiske Brothers Refining Co., Newark, N.J.
6.	Corrosion Preventive, Aircraft Engine	MIL-C-6529	Anti-Corrode 205, Cities Serivces Oil Co., N.Y., N.Y. Rust Ban 622, Humble Oil and Refining Co., N.Y. 19, N.Y.
7.	Hydraulic Fluid	MIL-H-5606	Mobil Aero Hydraulic Oil HFB, Socony Mobil Oil Co., Washington 5, D.C. TL-5874, Texaco Inc., N.Y. 17, N.Y. PED 2565, Standard Oil Co. of California, San Francisco 20, California
8.	Grease (High Temperature)	MIL-G-81322	Mobile Grease 28, Mobile Oil Corp., Shoreham Bldg., Washington, D.C. 20005
***9.	Grease (High & Low Temperature)	MIL-G-23827	Aeroshell Grease No. 7, Shell Oil Co., N.Y., N.Y. RR-28, Socony Mobile Oil Co., Inc. Washington 5, D.C. Supermil Grease No. A72832, American Oil Co., Chicago, Illinois.
10.	Lubricating Oil (Low Temperature)	MIL-L-7870	Esso Aviation Instrument Oil, Esso Standard Oil, N.Y., N.Y. Gulflite Oil 6, Gulf Oil Corp., Pittsburg, Penn. Sinclair Aircraft Orbitlube, Sinclair Refining Co., N.Y., N.Y.
11.	Lubricating Oil	SAE No. 10W/30	

CONSUMABLE MATERIALS CHART (Cont'd)

ITEM	NOMENCLATURE	SPECIFICATION	EQUIVALENT COM'L PRODUCT AND VENDOR
12.	Deleted		
***13.	Grease (General Purpose)	MIL-G-81322 (Supersedes MIL-G-7711)	Regal Starfax Premium 2, Texaco Inc., N.Y. 17, N.Y.
14.	Lubricant, Rubber Seal	Oakite 6 Compound	Oakite Products Inc., N.Y. 7, N.Y.
15.	Lubricant (Krylon, Heavy Duty)	Silicone Lubricant Spray No. 1325, No. 1329 (or equivalent)	Krylon Inc. - Aerosol Products Norristown, Pennsylvania 19404
16.	Chromic Acid	CrO_3	VWR Scientific 1363 South Bonnie Beach Pl. Los Angeles, CA. 90023 Curtin Matheson Scientific Co. 3160 Terrace Street Kansas City, MO. 64111 Ashland Chemical Co. 3 Broad Street Binghamton, N.Y. 13902 Canada Laboratory Supplies, Ltd. 80 Jutland Road Toronto 550 Ontario, Canada Baker Chemikalien 608 Cross Gerau, W. Germany Reactivos S.A. Apartado 61.649 Caracas, Venezuela
17.	Calcium Sulfate	$Ca\ SO_4$	VWR Scientific 1363 South Bonnie Beach Pl. Los Angeles, CA. 90023 Curtin Matheson Scientific Co. 3160 Terrace Street Kansas City, MO. 64111 Ashland Chemical Co. 3 Broad Street Binghamton, N.Y. 13902 Canada Laboratory Supplies, Ltd. 80 Jutland Road Toronto 550 Ontario, Canada Baker Chemikalien 608 Cross Gerau, W. Germany

ITEM	NOMENCLATURE	SPECIFICATION	EQUIVALENT COM'L PRODUCT AND VENDOR
17.	Calcium Sulfate (Cont'd)	$CaSO_4$	Reactivos S.A. Apartado 61.649 Caracas, Venezuela

*If rated octane fuel is not available, use the next higher octane fuel rating.

**Mix with quick evaporating liquid naphtha and apply with a brush.

***In extremely cold climates MIL-G-23827 grease should be used in place of MIL-G-81322 grease. Care should be exercised when using either MIL-G-81322 or MIL-G-23827 grease, as they contain a rust preventing additive which is harmful to paint.

APPROVED ENGINE OILS

APPROVED ENGINE OILS FOR CONTINENTAL ENGINES

COMPANY	BRAND IDENTIFICATION
BP Oil Corporation	*B/P Aero Oil 65/80
Castrol Limited (Australia)	*Grade 40, Castrolaero AD, Type III *Grade 50, Castrolaero AD, Type II
Continental Oil Company	**Conoco Aero S No. 65 (SAE 30) **Conoco Aero S No. 80 (SAE 40) *Conoco Aero S SAE 10 W 30
Delta Petroleum Company	*Delta Avoil - Grades 30, 40, and 50
Gulf Oil Corporation	**Gulfpride Aviation Series D
Humble Oil and Refining Company	*Esso Aviation and Enco Aviation In grades E65, E80, E100, E120, and A100
Kendall Refining Company	**Kendall Aviation Oil Type D
Pennzoil Company	*Pennzoil Aircraft Engine Oil, Heavy Duty Dispersant, Grades 30, 40, and 50
Phillips Petroleum Company	*Phillips 66 Aviation Oil Type A (Replaced HD Aviation Oil)
Quaker State Oil and Refining Corporation	*Quaker State AD Aviation Engine Oil Grades 20W/30, 40, and 50

APPROVED ENGINE OILS FOR CONTINENTAL ENGINES

COMPANY	BRAND IDENTIFICATION
Shell Oil Company	*Aeroshell Oil W *Aeroshell Oil W (in 4 grades) Grade 120 (Nominal SAE 60)- Military Grade 1120 Grade 100 (Nominal SAE 50)- Military Grade 1100 Grade 80 (Nominal SAE 40)- Military Grade 1080 Grade 65 (Nominal SAE 20 or 30)- Military Grade 1065
Sinclair Refining Company	*Sinclair Avoil 20W-40
Socony–Mobil	**Aero Red Band HD (SAE 50) **Aero Gray Band HD (SAE 40) **Aero White Band HD (SAE 30) *Mobi Aero Oil 65 *Mobi. Aero Oil 80 *Mobi. Aero Oil 100 *Mobil Aero Oil 120
Standard Oil of California	**RPM Aviation Oil(Compounded)
Texaco Incorporated	**Texaco Aircraft Engine Oil D100 **Texaco Aircraft Engine Oil D80 *Texaco Aircraft Engine Oil - Premium AD, Grades 65, 80 and 100
Union Oil Company of California	*Union Engine Oil HD Grades 80 and 100

APPROVED ENGINE OILS FOR LYCOMING ENGINES

COMPANY	BRAND IDENTIFICATION
Delta Petroleum Company Incorporated	*Global Concentrate A
Enjay Chemical Company	*Paranox 160 and 165
Mobil Oil Corporation	RT-451, RM-173E, RM-180E
Shell Oil Company	*Shell Concentrate A Code 60068 *Aeroshell W 120 *Aeroshell W80
Texaco Incorporated	*TX-6309 *Aircraft Engine Oil Premium AD120 *Aircraft Engine Oil Premium AD80
American Oil and Supply Company	*PQ Aviation Lubricant 753
Chevron Oil Company	*Chevron Aero Oil Grade 120

APPROVED ENGINE OILS FOR LYCOMING ENGINES

COMPANY	BRAND IDENTIFICATION
Humble Oil and Refining Company	*Esso Aviation Oil E-120 *Enco Aviation Oil E-120 *Esso Aviation Oil A-100 *Enco Aviation Oil A-100 *Esso Aviation Oil E-80 *Enco Aviation Oil E-80
Standard Oil Company of California	*Chevron Aero Oil Grade 120
Castrol Oils, Incorporated	***Castrolaero 113, Grade 1065 ***Castrolaero 117, Grade 1100
Champlin Oil and Refining Company	***Grade 1065 ***Grade 1100
Chevron Oil Company	***Chevron Aviation Oil 65 ***Grade 1100
Continental Oil Company	***Conoco Aero Oil 1065 ***Conoco Aero Oil 1100
Mobil Oil Corporation	***Avrex 101/1065 ***Avrex 101/1100
Phillips Petroleum Company	***Phillips 66 Aviation Engine Oil, Grade 1065 ***Phillips 66 Aviation Engine Oil Grade 1100
Shell Oil Company	***AEROSHELL Oil 65 ***AEROSHELL Oil 100

*Ashless Dispersant Oils

**Detergent Oils

***Straight Mineral Oils

The vendor products appearing in this chart have been selected at random to help field personnel determine products conforming to the specifications in this publication. The brand names are listed for ready reference and are not specifically recommended by Beech Aircraft Corporation. Any product which conforms to the referenced specification may be used.

Serials M-1 through M-554, M-1095 and after, MA-1 and after and MC-2 and after, use corrosion preventive oil per Lycoming Service Letter L-121A. The engine manufacturer strongly recommends that the corrosion preventive oil be removed at the end of the first 25 hours of operation and must NEVER be used beyond 50 hours. When adding oil during the period that the corrosion preventive oil is in the engine, add only aviation grade straight mineral oil of the viscosity desired as necessary to maintain the correct oil level. After oil consumption stabilizes, change to aviation grade ashless dispersent oil. Refer to Lycoming Specification 301 E, and/or Lycoming Servicing Instruction No. 1014D.

3

DISASSEMBLY, ASSEMBLY AND MAINTENANCE

SECTION III

DISASSEMBLY, ASSEMBLY AND MAINTENANCE

This section contains disassembly, assembly and maintenance information on major components of the aircraft with step by step procedures given where it is considered necessary because the process is complex, such as the removing and installing of the wing. Illustrations, line drawings and photographs are shown to provide information on the location, adjustment and rigging of the components in the various systems.

STRUCTURAL REPAIR

Unless otherwise specified in the Shop Manual, the aircraft may be repaired in accordance with Federal Aviation Agency's "Aircraft Inspection and Repair", Manual A C 43.13-1A, and "Aircraft Alterations", Manual A.C.43.13-2.

HOISTING
(Figure 3-1)

Hoisting requires a suitable sling (P/N 169-590011 is recommended) and the addition of a sling stop on the fuselage. However, hoisting is recommended only under emergency conditions.

Procedures for hoisting are as follows:

a. At the bulkhead where the assist step is located and approximately 16 to 17 inches outboard of the bottom center line (opposite the assist step) a rivet must be drilled out. When drilling out the rivet enlarge the hole to .246 inch dia. to accommodate a 10K75 rivnut or equivalent. Install a bolt, washer and spacer. The assist step and spacer assembly serve as a sling stop. On aircraft with a LH door, the assist steps on each side serve as a sling stop, and the rivnut, bolt, washer, and spacer are not required.

b. The engine cowling must be removed to expose the sling attaching loop on top of the engine. When hoisting the aircraft, it is important to maintain a level or slightly nose down attitude.

NOTE

On later aircraft which are not equipped with an assist step, install bolts (LH or RH) as necessary to aid in hoisting.

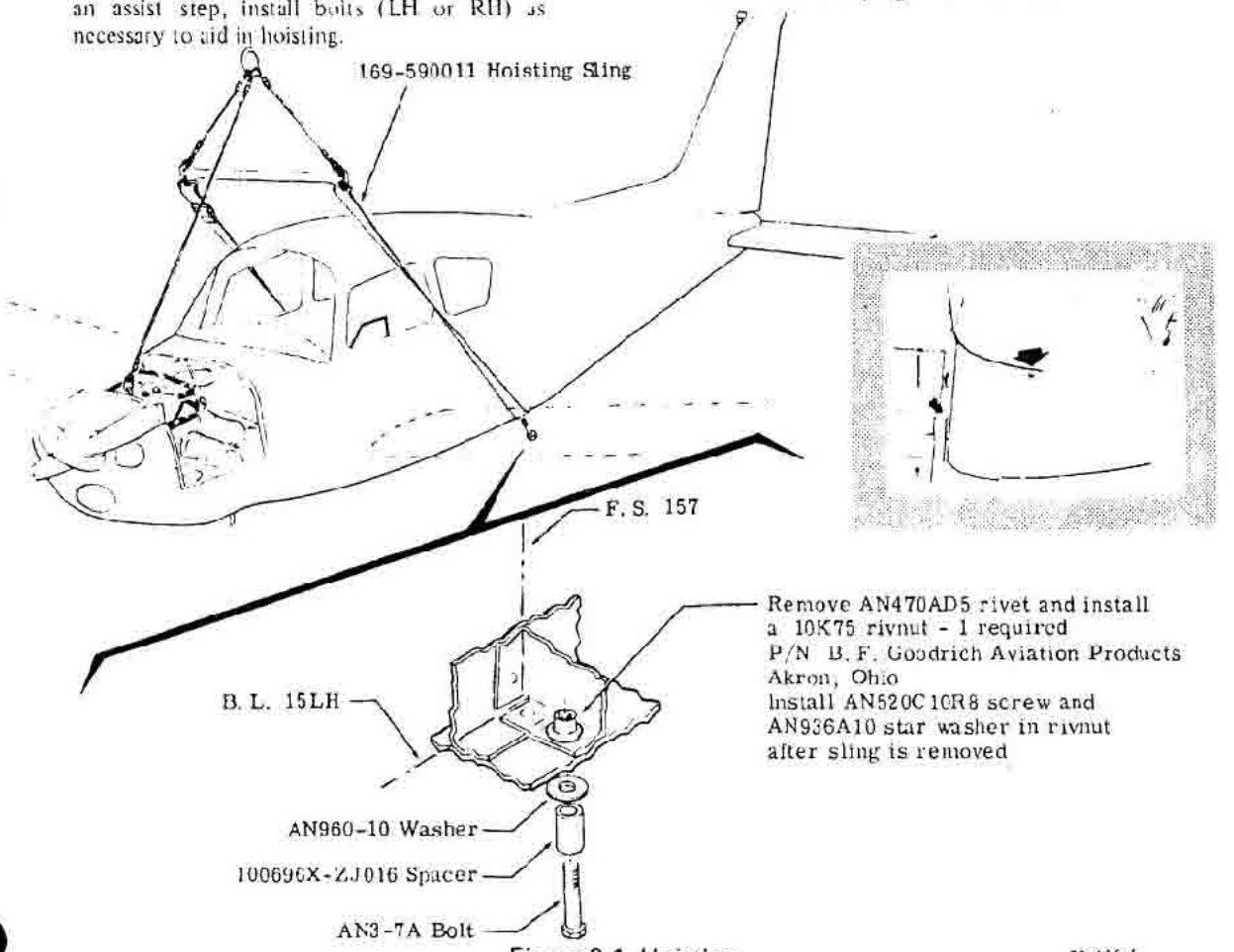


Figure 3-1. Hoisting

23-605-5

LEVELING

The aircraft may be leveled by placing the aircraft on individual scissors jacks (M-1 and after, MA-1 thru MA-368, MB-1 and after) or a three point jack (MC-2 and after) and leveling the baggage compartment floorboard. Using a bubble level, position the level approximately in line with the lateral and longitudinal axes of the aircraft and adjust the jack or jacks as necessary until the aircraft is level.

WING

WING REMOVAL
(Figure 3-2)

Before removing the wings a suitable cradle must be provided for the fuselage. The recommended cradling points are located at station 68.00 just aft of the firewall and at station 181.00

NOTE

When removing a wing provide adequate support for the opposite wing.

a. Drain and purge the fuel cells.

NOTE

Fuel will drain out of the honeycomb ribs after the main fuel supply is removed. This may require an hour to accomplish.

b. Remove the front seat belts and remove the seats as follows:

1. Remove the aft stops from the front seat tracks and, with the seat adjustment handle pulled up, move the seat to the rear to disengage the seat from the tracks. Remove the seats.

2. Unsnap the upholstery panel beneath the front of the rear seat and remove the rear seat.

c. Remove the cabin floorboards, then remove the spar cover between the front and rear seats. Remove the belly access door at fuselage station 132.00.

d. Remove the left and right hand upholstery panels located immediately above the pilot's and copilot's floorboards.

e. Remove the left and right hand fuselage access panels to the wing located immediately above the cabin floor and the four access panels located under the rear seat.

f. Remove the safety wire, release the tension and disconnect the aileron cables at the three turnbuckles.

g. With the flaps in the neutral position, disconnect the flap actuating push rod assembly (at the flap end of the push rod) and remove the flap.

NOTE

Before disconnecting the flap, check the locknuts on the rod ends for tightness. If the rod ends are allowed to turn it will be necessary to adjust the flap travel when the flaps are reinstalled.

h. After placing a shop towel under the brake line union located inboard of the fuselage skin at the root rib, disconnect the line and immediately cap both it and the fitting. On the A24R, disconnect and cap the landing gear hydraulic lines adjacent to the brake line. Cap the hydraulic lines and fittings to prevent the loss of fluid and the entry of foreign material into the system.

i. Disconnect the pitot line at the union located inboard of the wing root. The end of this line should be secured to the wing spar after the wing has been separated from the fuselage. Then disconnect the fuel lines at the wing root outboard of the fuselage skin.

j. Disconnect the electrical leads to the fuel quantity transmitters at the transmitters located at the wing root. All other electrical wiring to the wing should be cut at the permanent splice and secured to the structure to prevent the wires from retracting into the wing and fuselage structure during repair. Of course, the wing must be separated from the fuselage before the wiring can be secured to the adjacent structure.

k. Use a suitable dolly to support the fuselage when removing the wing bolts. The hoist sling is not recommended for use under other than emergency conditions.

NOTE

Before loosening any wing mounting bolts, cradle the wing being removed, and place a suitable support under the opposite wing.

l. Remove the Huck and NAS bolts securing the spar splice plates and wing spar together. A special collar splitter, P/N 42-10, may be used to shear the aluminum collars and allow the Huck bolts to be driven out. Next, remove the attaching bolts from the fore and aft wing attaching lugs.

CAUTION

Care should be taken not to elongate the holes when driving the Huck bolts out. Avoid sharp nicks or gouges.

NOTE

If a collar splitter is not available, AN960-816L washers may be slipped over the Huck collar, and the collars split with a chisel. The chisel should be used in the direction perpendicular to the wing spar.

m. Remove the bolts in the wing attach lug fitting immediately forward and aft of the spar.

n. Pull the wings straight away from the fuselage, constantly checking to make sure that no electrical wiring, cables or lines are caught in the fuselage.

WING INSTALLATION

(Figure 3-2)

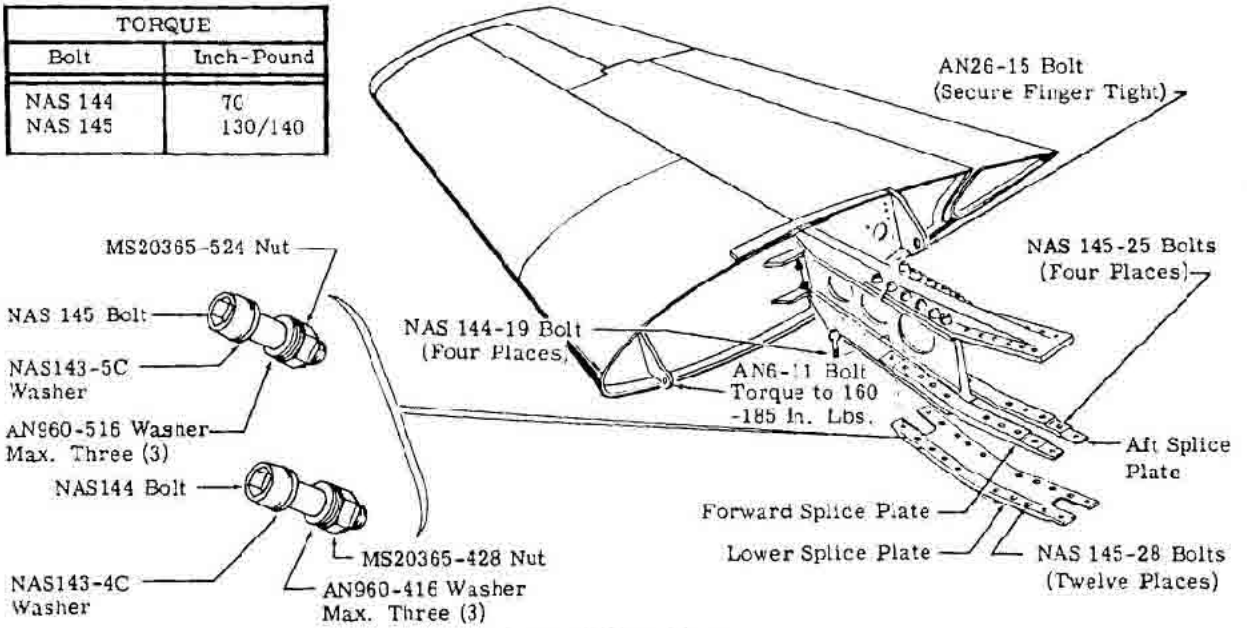
a. Clean all fuselage-to-wing mating surfaces with solvent and blow dry with compressed air.

WARNING

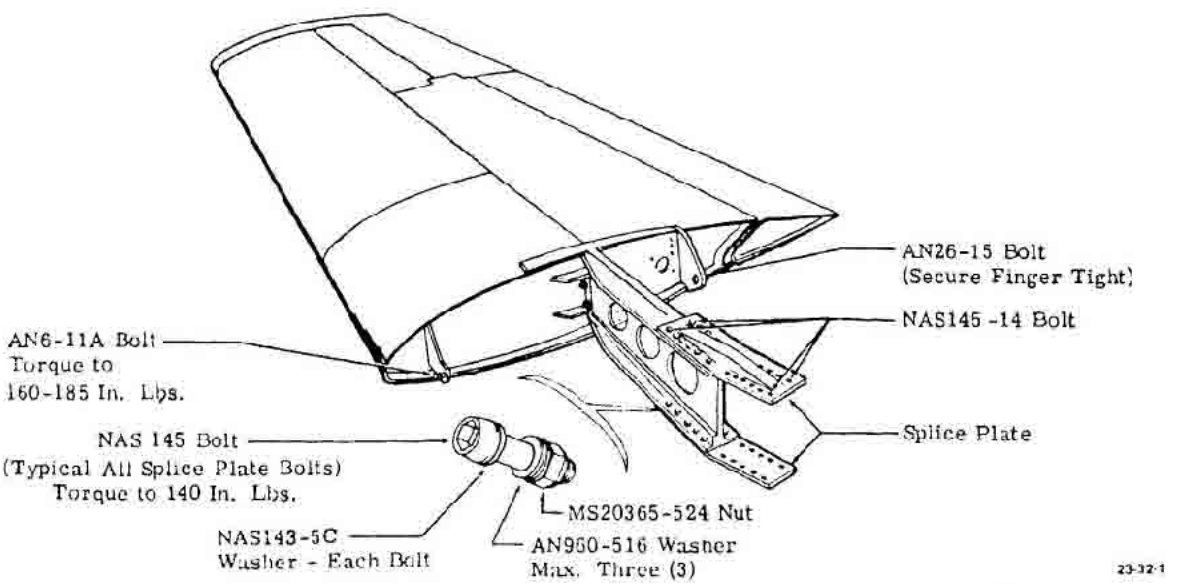
Before installation of the attaching bolts inspect the forward and aft wing attachment lugs for existence of grip bushings.

b. Position the wing on the fuselage. Make certain there are no lines or electrical wiring caught between the wing and the fuselage. Install an AN26-15 bolt in the aft wing attaching lug and an AN6-11A bolt in the forward lug. Repeat these steps for the opposite wing.

TORQUE	
Bolt	Inch-Pound
NAS 144 NAS 145	70 130/140



Lower Splice Plates
M-555 And After, MA-1 And After, MB-1 And After, MC-2 And After.



M-1 thru M-554

Figure 3-2. Wing Assembly

NOTE

Tighten finger tight and install cotter keys in the AN26-15 bolts in the aft fittings. Torque the AN6-11A bolts in the forward wing fittings to 160-185 inch-pounds.

c. Position the wing spar splice plates on the wing spars and install NAS145-14 bolts through the two mounting holes on each end of the wing spar upper splice plate. NAS145-19 bolts go in the remaining holes in the upper and lower splice plates from which the Huck bolts were removed. Secure with MS20365-524 nuts and AN960-516 washers. (A maximum of three AN960-516 washers may be used under each nut.) Torque all wing splice plate bolts to 130-140 inch-pounds.

d. Except for the added lower wing spar splice plates on serials M-555 and after, the wing spar splice installation procedures are the same as those on serials prior to M-555. On serials M-555 and after, a forward and aft spar splice plate is installed on the lower spar flanges above the lower main spar splice plate (see Figure 3-2). Position the splice plates and install NAS144-19 bolts through the two mounting holes on each end of the wing spar lower splice plate. Secure with MS20365-428 nuts and AN960-416 washers. (A maximum of three AN960-416 washers may be used under each nut.) Torque bolts to 70 inch-pounds. Install NAS145-25 bolts and NAS145-28 bolts in the remaining holes as shown in Figure 3-2. Secure with MS20365-524 nuts and AN960-516 washers. (A maximum of three AN960-516 washers may be used under each nut.) Torque bolts to 130-140 inch-pounds.

NOTE

One NAS143-4C or one NAS143-5C washer must be installed under each NAS144 or NAS145 bolt head. Be sure washer and bolt match properly as the washer is recessed to accept the bolt head.

NOTE

Electrical wiring not having quick disconnects requires permanent splices. Splices should be made according to best shop practice.

e. Connect the fuel lines at the wing root immediately outboard of the fuselage. Connect the pitot line at the union fitting inboard of the wing root and connect the hydraulic brake lines at the unions located inboard of the fuselage skin adjacent to the wing root. Bleed the brake system.

NOTE

If the aircraft has dual brakes it will be necessary to use a pressure pot, bleeding from the wheel cylinder upward.

f. Install the flap on the wing and connect the flap actuator rod assembly to the flap and check the locknuts on the rod assembly for tightness. Route and connect the aileron cables at the three turnbuckles. Refer to the rig[illegible] instructions for rigging the aileron system.

g. After all systems have been rigged, replace the access doors, upholstery panels, floorboards, carpet, front and rear seats and front seat belts.

NOTE

Make certain that the pin is in the fuel selector shaft for proper location of the handle.

WING LEADING EDGE REPAIR

(Figure 3-3)

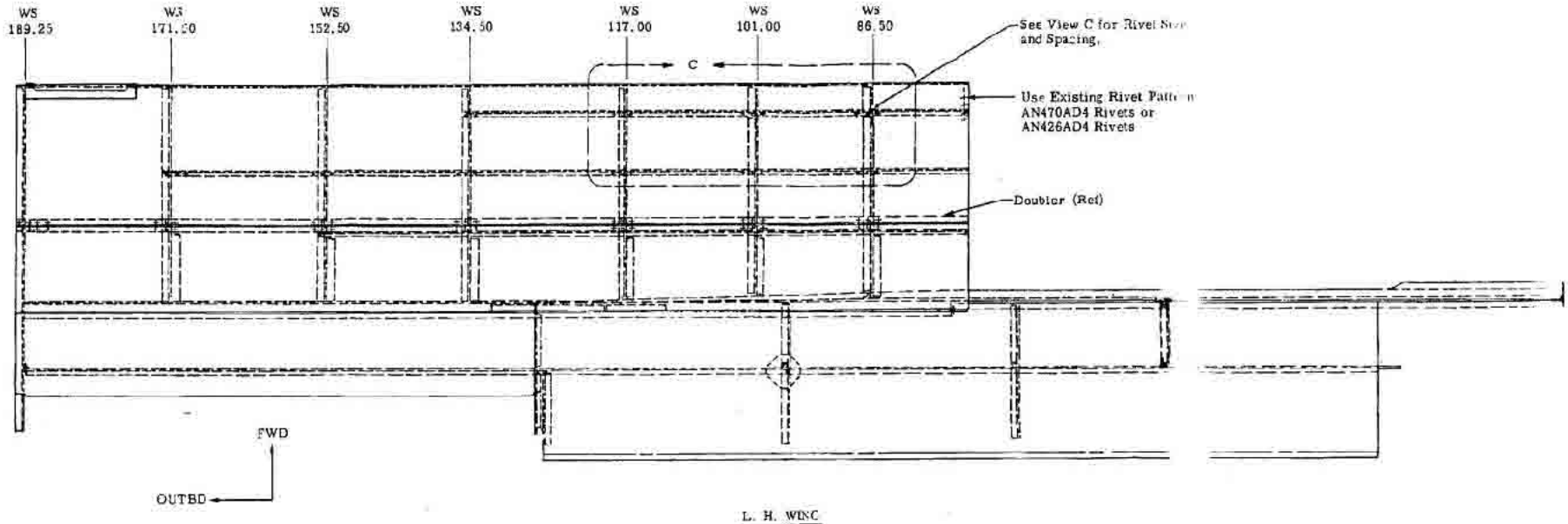
WARNING

It is neither practical nor permissible to make a field repair of the bonded leading edge or of the fuel cell by the bonded method. In the event of doubt about the proper or the most economical method of repair, contact the Service Department, Beech Aircraft Corporation, Liberal Division, Post Office Box 300, Liberal, Kansas 67901.

The above noted figure provides procedural steps for re[illegible] of damage to the outboard wing leading edge sect[illegible] Although the wing is bonded and incorporates the new "honeycomb" rib construction, normal FAA approved sheet metal practices are sufficient for repairs. Since neither the extent nor location of such damage can be predicted, the illustrations outline repairs of a general nature which may be modified to fit the individual case, provided the limits stipulated are observed.

A leading edge replacement skin (P/N 169-110000-291 for all models except A24R or 169-110001-331 LH and 169-110001-332 RH for the A24R) are available for repairs in an area from wing station 73.75 through wing station 189.25. The 169-110000-291 replacement skin may be used for repair of either the right or the left wing. The replacement skins are preformed to the contour of the leading edge in the area noted above and may be used for rework or section replacement of the skin up to an area approximately 57 inches long. It is permissible to make a repair to an area in excess of 57 inches in length. 169-110000-13 (LH) or 169-110000-14 (RH) outboard ribs may be used in place of the bonded ribs in the leading edge. The 23-001042-609 (LH) and the 23-001042-610 (RH) skin and stringer bond assembly may also be used for repair of the wing leading edge. The stringers bonded to the 23-001042-609(-610) should be spliced to any existing stringers as shown in Figure 3-3.

Kits are also available for replacing the entire bon[illegible] leading edge assembly, outboard of the tank area on Musketeers where the severity of wing damage precludes



L. H. WING

Excluding Aileron, Flap & Fuel Tank

This View Illustrates a Repair Extending Aft From The Leading Edge Approximately 16 Inches And For The Full Length of The Outbd Leading Edge Section

Figure 3-3. Wing Leading Edge Repair (Sheet 1 of 3)

1. This illustration is intended to be of a general nature indicating typical repair procedure for the bonded leading edge. Details may be varied as required for different applications. Standard sheet metal procedures shall apply. (Reference AC 43.13-1)

2. $\frac{4}{M}$ Denotes an AN470AD4 rivet, brazier head near side.

$\frac{3}{CF}$ Denotes an AN426AD3 rivet, flush head near side, machine countersink.

$\frac{4}{DF}$ Denotes an AN426AD4 rivet, flush head near side, dimpled.

3. This illustration may be used as a reference to order parts.

4. Fill gaps in the repaired area with White Streak Solder, (P/N Plastics Division of Dynatron Corp., Atlanta, Georgia) or PR 1220 Part A and B, (P/N REN Plastics Inc. Lansing, Michigan). Sand smooth before painting.

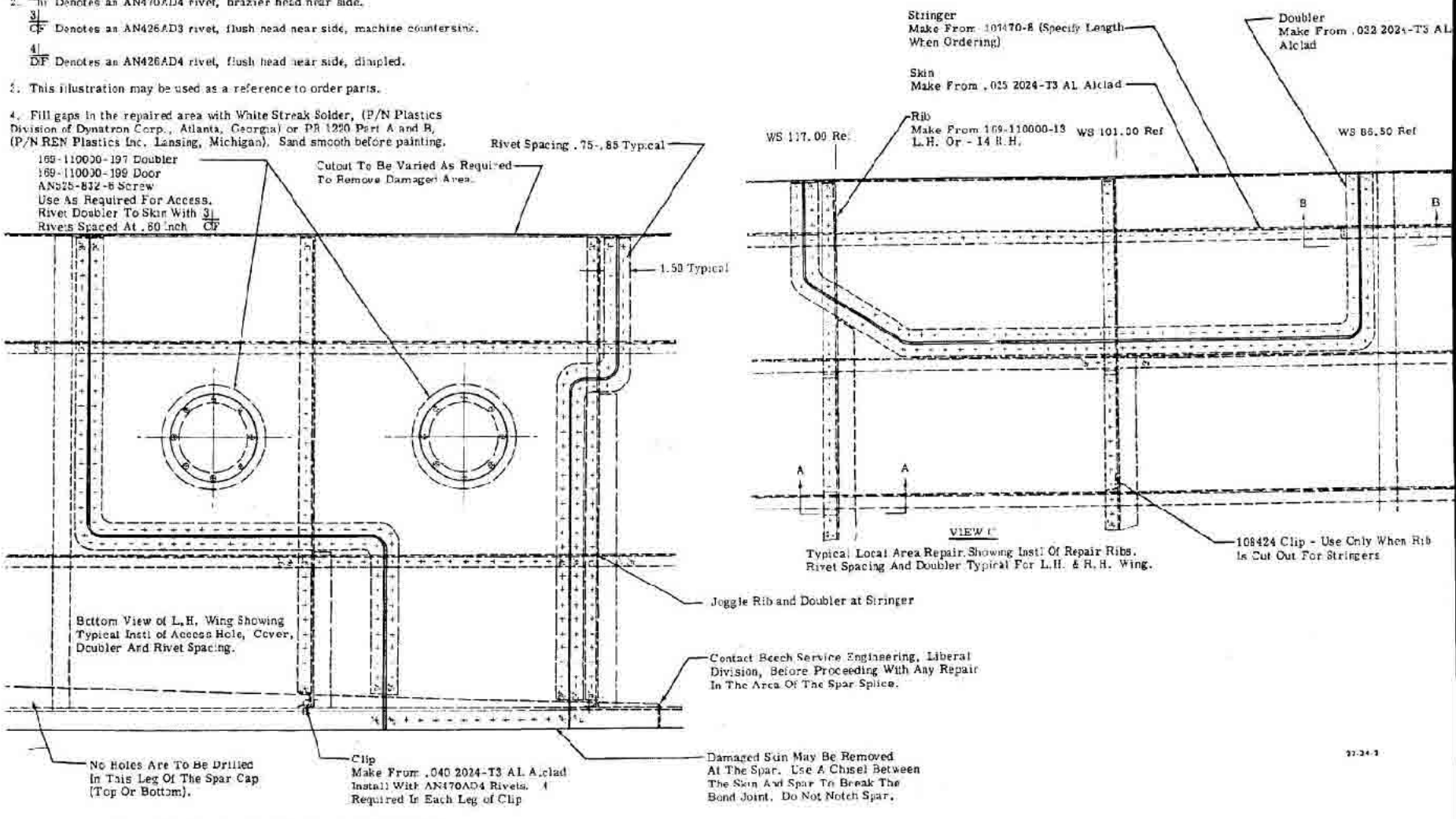
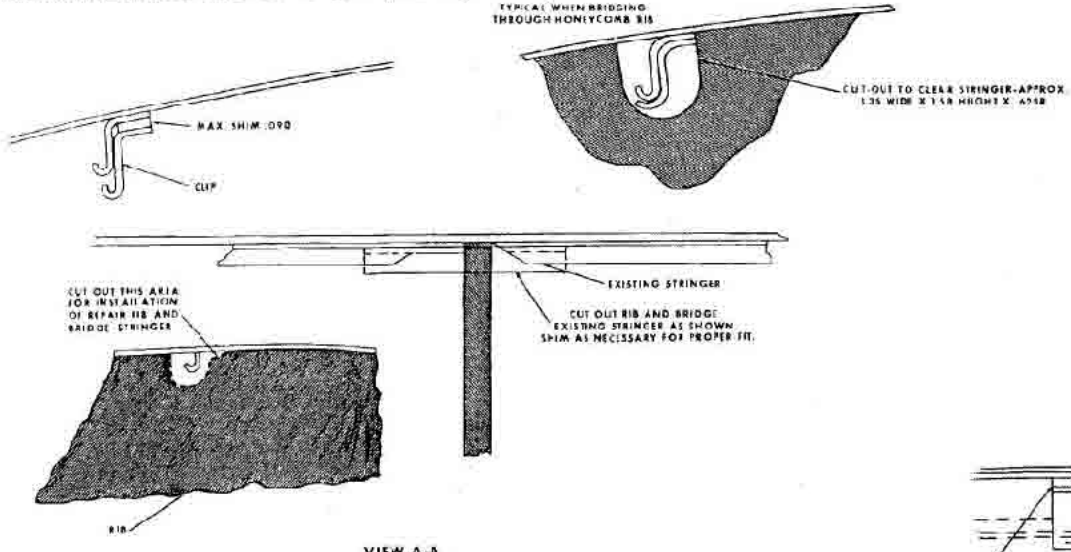


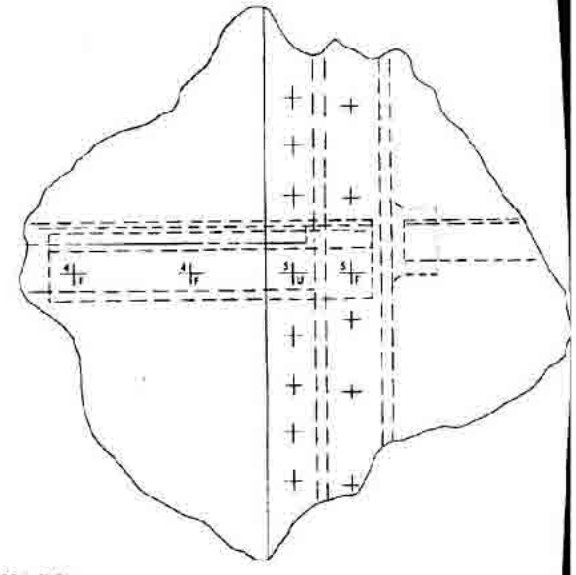
Figure 3-3. Wing Leading Edge Repair (Sheet 2 of 3)

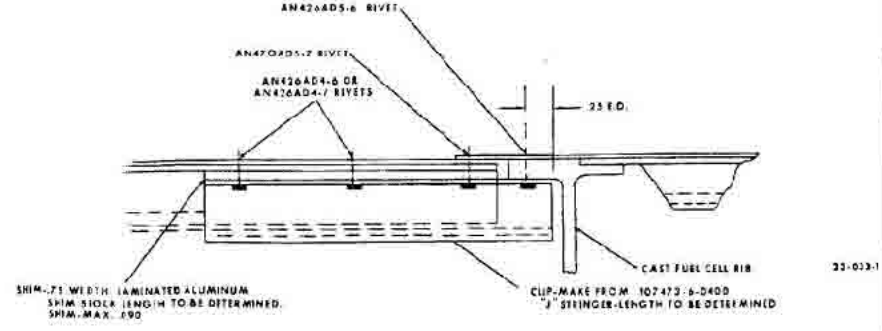
NOTE

Although the Musketeer wing is stressed for normal flight loads, a few reports from the field have indicated isolated instances of overstress. Half-moon depressions at the stringers in the top of the wing adjacent to the first honeycomb rib outboard of the fuel cell are one indication of overstress. Corrective measures for this type of defect are shown in view "AA". Deformation in the outboard end of the fuel cell between the row of flush rivets and the row of AN470 rivets may occur in the form of a raised area at the ends of the stringers in the outboard wing leading edge section. The raised areas should be formed down, then the stringers bridged across the area and attached to the fuel cell rib as shown in view "BB". Another indication of excess wing loading is the formation of wrinkles or depressions running diagonally aft and outboard from the wing leading edge in the area between the fuel cell cast rib and the first honeycomb rib outboard. The correct method of repair for such damage is to straighten the skin back to normal contour and add a doubler or the inner surface with AN426 rivets spaced approximately one inch apart.



VIEW A-A
(OF SHEET 2 OF 3)





VIEW B-B
(OF SHEET 2 OF 3)

Figure 3-3, Wing Leading Edge Repair (Sheet 3 of 3)

NOTE

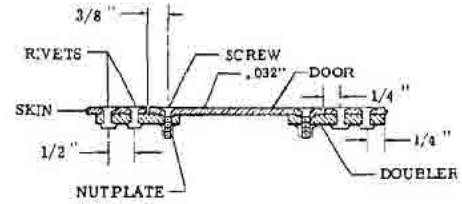
Repair of the Fuel Cell is permissible providing the damaged area is far enough from the honey comb rib to allow a doubler or plate to be installed. Holes cut to remove damaged area must be round or at least have generous radii. Should a stringer be damaged or fall within the repair area it must be bridged across and be attached to the repair.

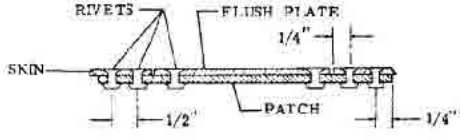
CAUTION

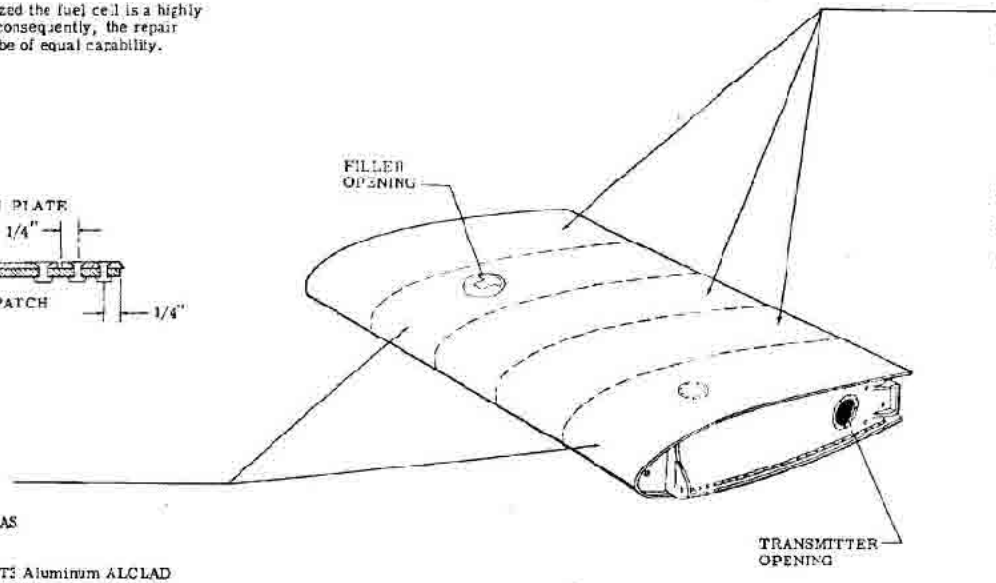
It must be realized the fuel cell is a highly stressed area; consequently, the repair structure must be of equal capability.

GENERAL INSTRUCTIONS

1. Seal edges of doubler or plate, rivet butts and nut plates with EC1293 sealer, P/N of the 3M Company.
2. Fill the rivet heads, screw heads and the patch/skin joints with White Streak Solder, Product of Plastics Division, Dynatron Corp., Atlanta, Georgia, or PR1220, Part A & B, P/N of REN Plastics Inc., 5656 South Cedar St., Lansing, Michigan, or a filler of your choice, then sand smooth and refinish.
3. Pressure test (not more than 1 psi) before applying filler to outer surface.







REPAIR OF INACCESSIBLE AREAS

1. Door material - .032 2024 T3 Aluminum ALCLAD,
   Doubler material - .051 2024 T3 Aluminum ALCLAD,
   Nut Plates - K1000-832 or equivalent.
   Screws - AN507-8R--length to be determined.
   Rivets - AN426AD3--for attaching nut plates.
   Rivets - AN426AD4--for attaching doubler.
   Sealer - EC1293
2. Two rows rivets in doubler and skin--1/4"E.D., 1/2" spacing between rows and rivets.
3. Single row of screws through doubler and door--3/8" E.D., 5/8" spacing. Dimple door and countersink doubler.
4. Doubler may be cut on one side only in order to place it on inside of cell. Cut side of doubler to be placed on inboard or outboard side of repair.

REPAIR OF ACCESSIBLE AREAS

1. Rivets - AN426AD4-5
   Patch material - .032 2024 T3 Aluminum ALCLAD
   Plate material - .032 2024 T3 Aluminum ALCLAD
2. Two rows rivets through patch and skin (patch plate to be on inner surface of cell. --If the plate is too large for entry through access openings, use method for inaccessible area.)
3. Rivet E.D. 1/4"--spacing 1/2" between rows and rivets.
4. Fit flush plate and secure with only enough rivets to prevent filler from cracking.

Figure 3-4. Minor Fuel Tank Repair

the use of the preceding repairs. Kit No. 23-9-5 covers leading edge replacement for the left wing while Kit No. 23-9-7 covers the right wing on all aircraft except the A24R. Kit No. 23-9-9 covers leading edge replacement for the left wing and Kit No. 23-9-11 covers the right wing on A24R aircraft. Each of these kits contains a leading edge assembly and the attaching rivets, screws and bolts, as well as instructions.

RESEALING FUEL TANKS
(Figure 3-5)

Most areas of the fuel tank are accessible for sealing leaks that may develop from being overstressed. In almost all instances a leak that develops will be found at the inboard, or the outboard fuel cell rib. Following is a general procedure for repair of leaks in fuel tanks, such as those used in the Musketeer.

a. Locate the exact area of the fuel leak by pressurizing the cell to not more than 1 psi and checking with a soap solution.

b. The repair of leaks in the tank area up to eleven inches outboard of the inboard rib can be accomplished by removing the fuel transmitter from the rib and sealing the skin-to-false spar joint (see Figure 3-5). This is accomplished from inside the cabin by removing the lower upholstery side panel and cover plate and exposing the fuel transmitter unit.

c. Work through the transmitter hole in the rib and apply 3M EC1293 sealer (product of Minnesota Mining and Manufacturing Co., Minneapolis, Minnesota) to the area to be sealed.

d. To seal a leak in either the inboard or outboard ribs first determine the exact location of the leak by the method described above, then drill a No. 40 (.0980) hole approximately 1 inch on each side of the leak, and .45 inch from the rivet line toward the center of the fuel cell (see Figure 3-5). This will position the No. 40 hole directly over the V-shaped groove in the cast rib.

CAUTION

Do not drill into the rib, only through the skin.

e. Use a hand grease gun equipped with the Lincoln Engineering Co. Utility Needle Nozzle, P/N 5803, or equivalent, filled with 3M EC1293 sealer and force the sealer in one hole until it is forced out the hole on the opposite side of the leak. Remove excess sealer, clean, sand smooth and repaint the sealed area. The sealing instrument can be cleaned with methyl-ethyl-ketone.

NOTE

EC1293 must cure for a minimum of 12 hours before the fuel cell can be pressure tested or fuel added.

FUEL CELL REMOVAL

The fuel cell, although a bonded structure, is not bonded to

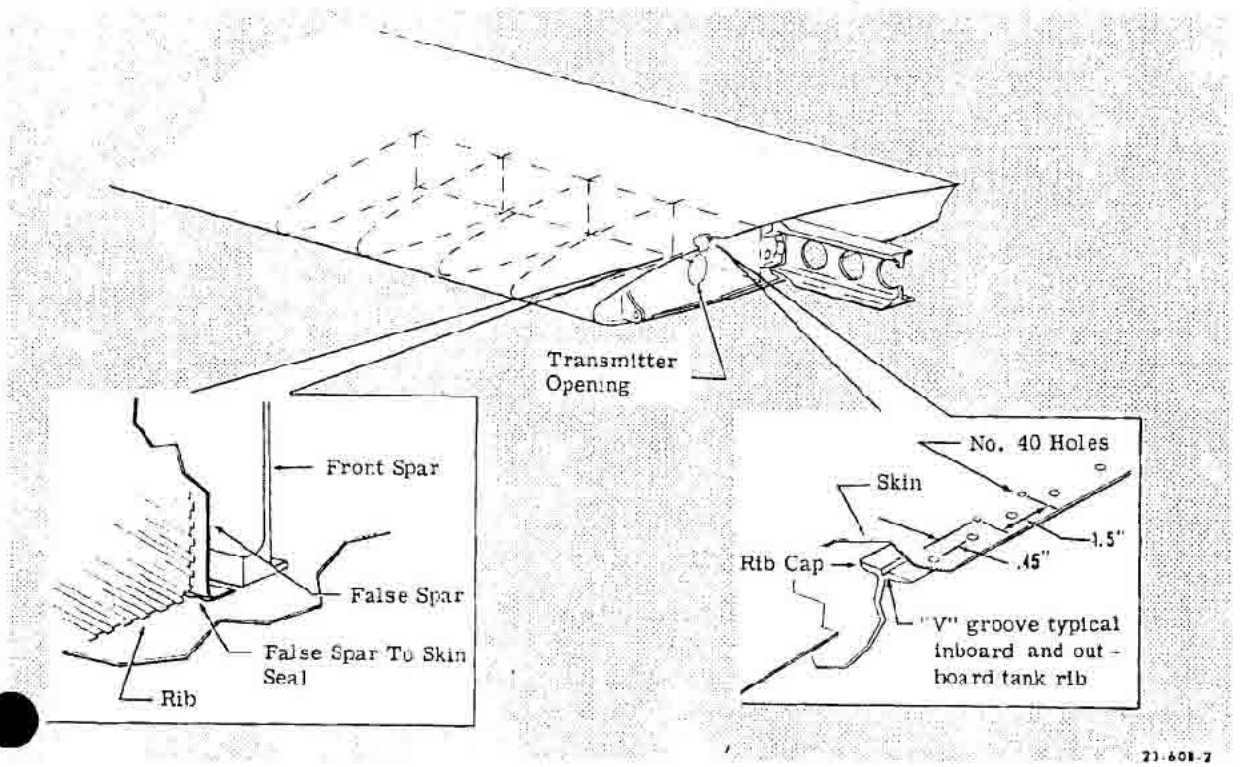


Figure 3-5. Resealing Fuel Tanks

the spar or outboard leading edge section. To remove a fuel cell, proceed as follows:

a. Remove the wing from the aircraft as described in this section.

b. Remove the aft wing closure forward of the flap.

c. Remove the landing gear and the landing gear support weld assembly.

d. Cut the two huck bolt collars on the bottom of the wing adjacent to the landing gear position and drive the huck bolts out. Then remove the two large NAS bolts in the top wing skin directly above the huck bolts just removed.

e. Peel off the wing root seal, being careful not to tear or damage the seal and drill out the rivets in the heavy straps extending aft from the spar.

f. Drill out the rivets attaching the fuel cell to the spar and to the outboard leading edge section skin, both top and bottom.

g. On Model A24R aircraft, drill out the "Jo" bolts that are located at the forward side of the wheel well which attach the false spar to a flange on the outboard fuel cell rib casting.

h. Support the fuel cell and remove the two bolts in each fuel cell and rib casting and spar web. Lift the fuel cell away from the wing.

NEW FUEL CELL INSTALLATION

a. By measuring the location of the bolt holes in the damaged fuel cell inboard rib casting, determine the hole center line on the cast rib of the new fuel cell and place a mark in this location. Position the new fuel cell with the mark centered in the holes in the spar web and clamp in place.

b. At the outboard end rib drill three holes, top and bottom in the fuel cell skin, using the outboard leading edge skin as a template. The first two holes should be drilled near the leading edge, top and bottom, while holding the fuel cell aft to nest against the outboard leading edge skin. Install a cleco or sheet metal screw as each rivet hole is drilled.

c. Check for gap between the outboard rib casting and the spar web with a feeler gage. If a gap exists it must be filled with a shim

d. With the required shim in place, the bolt holes can be drilled and the bolts installed in the outboard and inboard ribs and web.

e. By using a hole finder and by back drilling, the remaining rivet and bolt holes can be drilled.

f. Remove the fuel cell assembly, burr all holes and clean debris from the area.

g. Reposition fuel cell and install the bolts and rivets previously removed, except for the two huck bolts in the bottom of the wing. If huck bolts or huck installation equipment is not readily available, the huck bolts may be replaced with NAS144-25 bolts, MS20002-4 washers under the bolt heads, AN960-416 washers under the AN365-428 nuts. The nuts should be on the inside of the wing.

h. On Model A24R aircraft, install MS27039-0816 screws, AN960-8 washers, and AN364-832 nuts in place of the "Jo" bolts that were removed from the forward side of the wheel well.

i. Clean and inspect the area and install the aft wing closure, the landing gear weld assembly and the landing gear.

j. Clean and install the rubber extrusion at the root end of the wing. The recommended adhesive is 3 EC1300L. The black seal along the edge of the rubb extrusion is a two part mixture, EC801A and EC801B to be mixed in accordance with the manufacturer's recommendations.

k. Refer to Service Letter No. 67-22 for aircraft that have received hard landings.

NOTE

Holes in the rib castings and in the spar should be a close tolerance fit. Use extreme care when using the spar as a drill guide and do not remove more material than is absolutely necessary.

AILERON SYSTEM

AILERON REMOVAL

a. To preclude the possibility of installing the ailerons on the opposite wing, identify the right and left aileron by tagging or marking before removal.

b. Remove the aileron hinge inspection plate (top side).

c. Disconnect the push-pull tube from the aileron.

d. Remove the aileron hinge bolts and remove aileron

NOTE

Removal of the aileron does not charge the original rigging of the aileron.

AILERON INSTALLATION

a. Determine the correct aileron to be installed on the appropriate wing by the identification tag or mark and position the aileron in the hinge brackets and install the hinge bolts.

b. Connect the push-pull tube in the aileron.

c. Install the hinge inspection plate.

NOTE

The gap between the aileron leading edge and the wing trailing edge closure strip should be held to .3 inch. If the gap is too wide the aileron loses effectiveness near a stall. If the gap is too narrow a noise is created and transferred along the spar. When replacing a closure strip, before securing the strip to the trailing edge of the wing, position the strip to maintain the .3 inch gap along the aileron leading edge.

RIGGING THE AILERON AND RUDDER SYSTEM

(Figures 3-6, 3-7, 3-8, 3-14 and 3-15)

a. Clear the nose wheel from the ground to perm full travel of the nose wheel in either direction.

b. Insert a 1/4 inch bolt in the aileron rig pin hole in

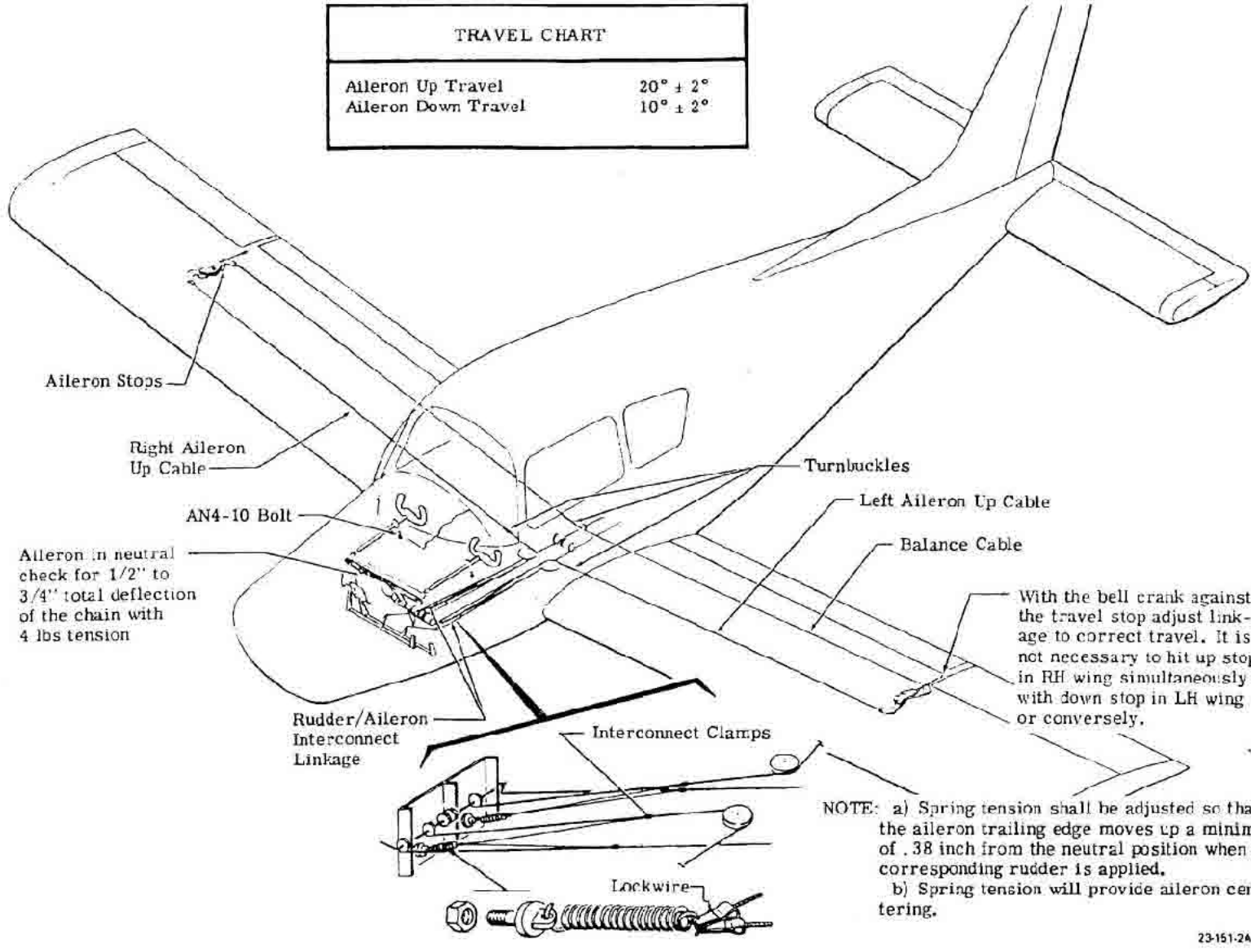


Figure 3-6. Aileron Control System M-1 thru M-962 and MA-1 thru MA-27

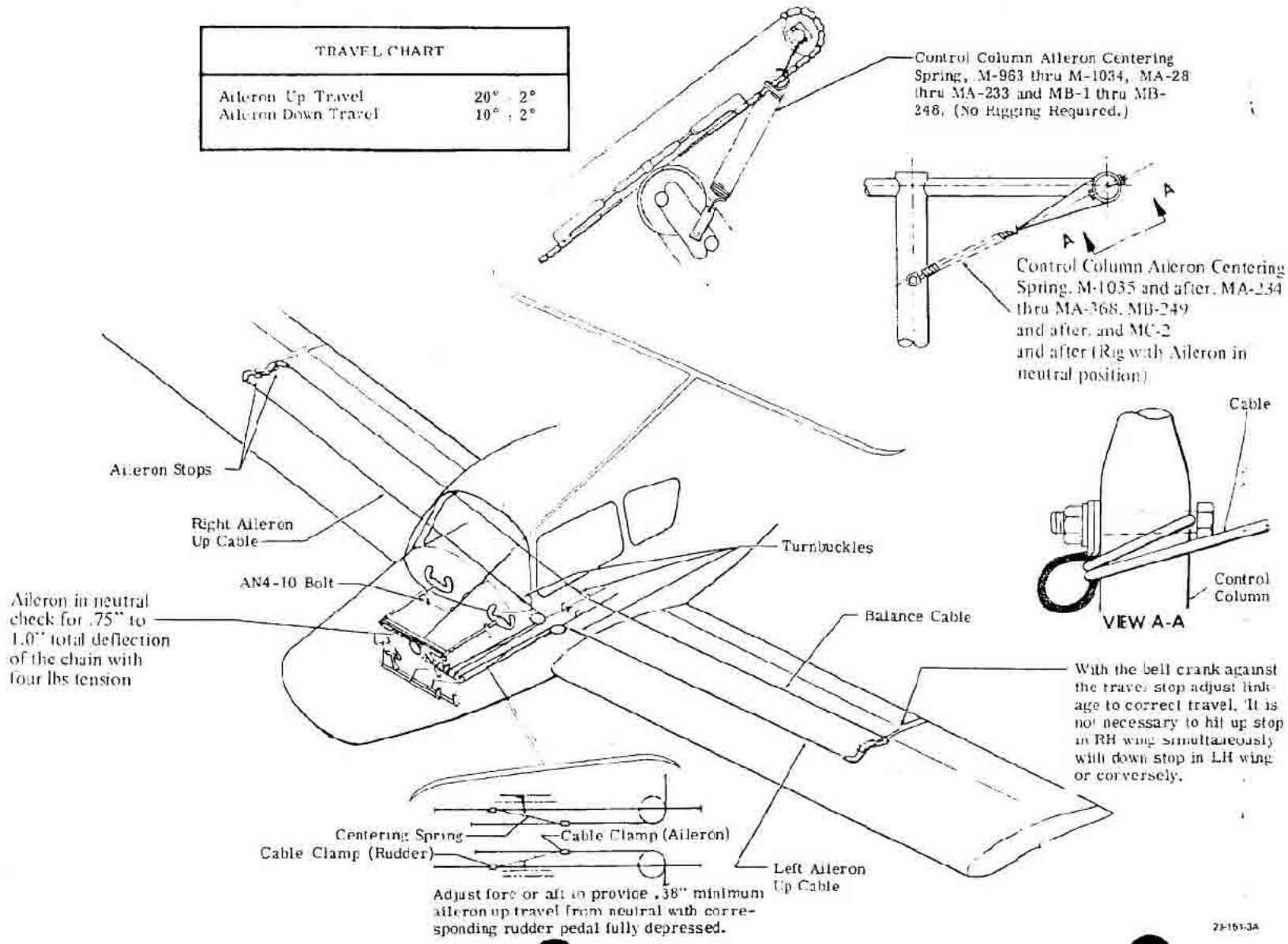


Figure 3-7. Aileron Control System M-963 and after, MA-28 and after, MB-1 and after and MC-2 and after

a. Determine the correct aileron to be installed on the appropriate wing by the identification tag or mark and position the aileron in the hinge brackets and install the hinge bolts. Safety wire the outboard hinge bolt.

b. Connect the push-pull tube to the aileron.

c. Install the hinge inspection plate.

NOTE

The gap between the aileron leading edge and the wing trailing edge closure strip should be held to .3 inch. If the gap is too wide the aileron loses effectiveness near a stall. If the gap is too narrow a noise is created and transferred along the spar. When replacing a closure strip, before securing the strip to the trailing edge of the wing, position the strip to maintain the .3 inch gap along the aileron leading edge.

RIGGING THE AILERON AND RUDDER SYSTEM

(Figures 3-6, 3-7, 3-8, 3-14 and 3-15)

a. Clear the nose wheel from the ground to permit full travel of the nose wheel in either direction.

b. Insert a 1/4 inch bolt in the aileron rig pin hole in the pilot's control column shaft and clamp a straight edge to the aft face of the rudder pedals.

c. With the rudder pedals locked in neutral, check the nose gear centering cable for proper rig. With the nose gear held in the straight ahead position, there should be equal spring tension on both nose gear centering cables.

d. Connect the rudder cables at the turnbuckles aft of the baggage compartment. Rig the neutral position of the rudder on fixed gear aircraft to 2-1/2 degrees to the right of center and 0 degree for retractable gear aircraft and adjust the cable tension as noted on the Cable Tension Temperature Chart. The rudder cable tension reading on serials, M-1 thru M-962 and MA-1 thru MA-27, must be taken aft of the interconnect cable clamps (see Figure 3-14). On serials, M-963 and after, MA-28 through MA-368, MB-1 and after and MC-2 and after, the cable tension reading may be taken at any point along the cables between the pulleys (see Figure 3-14). Final rigging to center the turn and bank ball is a flight function and may change the neutral position considerably. Travel limits must be measured from the final rig position.

NOTE

A clearance of 1/4 inch should be maintained between the leading edge skins of the rudder and the trailing edge skins of the vertical stabilizer through full travel. Improper rigging and insufficient clearance may allow the rudder skin to overlap the vertical stabilizer skin and restrict the rudder travel.

e. Connect the aileron cables and adjust so that the aileron inboard trailing edge on serials M-1 through M-554 aligns with the flap trailing edge. On serials M-555 and after, MA-1 through MA-368, MB-1 and after and MC-2 and after, align the lower surface of the aileron trailing edge so that it is flush with the lower edge of the flap. Adjust the cable tension as noted on the Cable Tension Temperature Chart. The aileron cable tension reading on serials M-1 thru M-962 and MA-1 thru MA-27, must be taken aft of the interconnect cable clamps (see Figure 3-6). On serials M-963 and after, MA-28 through MA-368, MB-1 and after and MC-2 and after, the cable tension reading may be taken at any point along the cables between the pulley. (See Figure 3-7.)

NOTE

Before rigging the aileron cables, adjust the tension on the chain bus system to obtain .75 to 1.0 inch total deflection with 4 pounds tension applied to the center point.

f. Remove the rig pins from the control column, straight edge from the rudder pedals and travel boards (if installed) and proceed with rigging the rudder/aileron interconnect system and (or) the aileron center system.

RIGGING THE RUDDER/AILERON INTERCONNECT SYSTEM

(Serials M-1 thru M-962 and MA-1 thru MA-27)
(Figure 3-6)

a. Check the aileron and rudder cables for the correct tension as noted on the Cable Tension Temperature Chart. Tension reading must be taken aft of the interconnect cable clamps.

b. Check the two bungee springs for an approximate 5-1/2 inch stretch between spring attaching points. This should establish minimum spring tensions, sufficient to obtain a movement of the aileron trailing edge up to .38 inch (minimum) from neutral position when full corresponding rudder is applied. Spring tension should tend to return both aileron and rudder toward the neutral position when the controls are released from the extreme travel position.

c. Make any necessary adjustments in 1/16 inch increments, by sliding the interconnect clamps forward or aft on the aileron or rudder cables.

RIGGING THE INTERCONNECT SYSTEM

(Serials M-963 and after, MA-28 through MA-368, MB-1 and after and MC-2 and after and aircraft prior to M-963 and MA-28 complying with BEECHCRAFT Service News, Volume XX, No. 11)
(Figure 3-7)

a. Check the aileron and rudder cables for the correct tension as noted on the Cable Tension Temperature Chart. Tension readings may be taken at any point along the cables between the pulleys.

b. Adjust the interconnect spring and cable assemblies by sliding one or both clamps forward or aft on the rudder or aileron cables until the aileron trailing edge moves up a

The graphs in Figure 3-8 specify the correct maximum and minimum cable tension permissible for the various controls when rigged at temperatures varying from 30°F to 100°F. The horizontal scale on the graph designates the temperature in degrees Fahrenheit at which the control cables may be rigged, and the vertical scale designates the correct tension in pounds for each temperature reading.

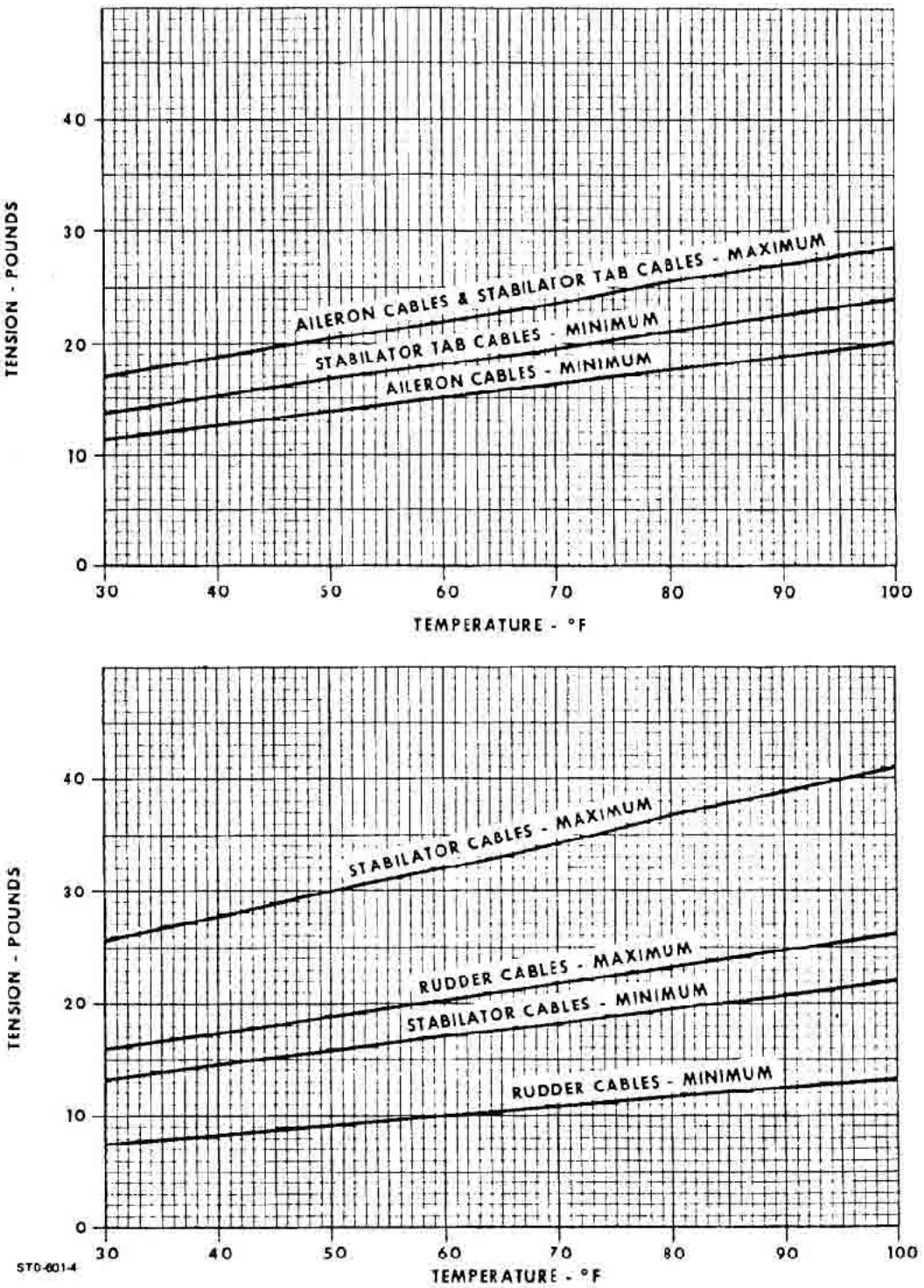


Figure 3-8. Effect of Temperature Upon Cable Tension

RIGGING THE CONTROL COLUMN AILERON CENTERING SPRING

(Serials M-1035 and after, MA-234 and after, MB-249 and after and MC-2 and after)
(Figure 3-7)

a. Position the ailerons in neutral and install a 1/4 inch bolt in the aileron rig pin hole in the pilots control shaft.

b. Loosen the centering spring cable retainer bolt and position the cable around the control shaft so that an equal amount of cable tension is obtained on each side of the shaft.

c. Tighten the centering spring cable retainer bolt and remove the rig pin from the control shaft.

AILERON CENTERING CABLE MODIFICATION (LONGER CABLE)

(Serials M-963 thru M-1284, MA-28 thru MA-361 and MA-368, MB-1 thru MB-461)

Installation of a longer cable assembly, P/N 169-524059-7, as a replacement for the original cable assembly, P/N 169-524059-3, may be accomplished by incorporating Service Instructions No. 0253-151.

EMPENNAGE

(Figure 3-11)

STABILATOR TAB REMOVAL

a. Remove the stabilator tab tip on the left side.

b. Disconnect the actuator rod from the tab.

c. Support the tab and pull the hinge wire free of the tab.

STABILATOR TAB INSTALLATION

a. Install the hinge wire through the tab and stabilator hinge.

b. Reinstall the stabilator tab tip and connect the actuator rod.

c. Check the tab for excessive movement.

ELECTRIC STABILATOR TRIM TAB ACTUATOR

(Figure 3-9)

ELECTRIC TRIM TAB MOTOR AND CLUTCH ASSEMBLY REMOVAL

a. Remove the access door on each side of the aft

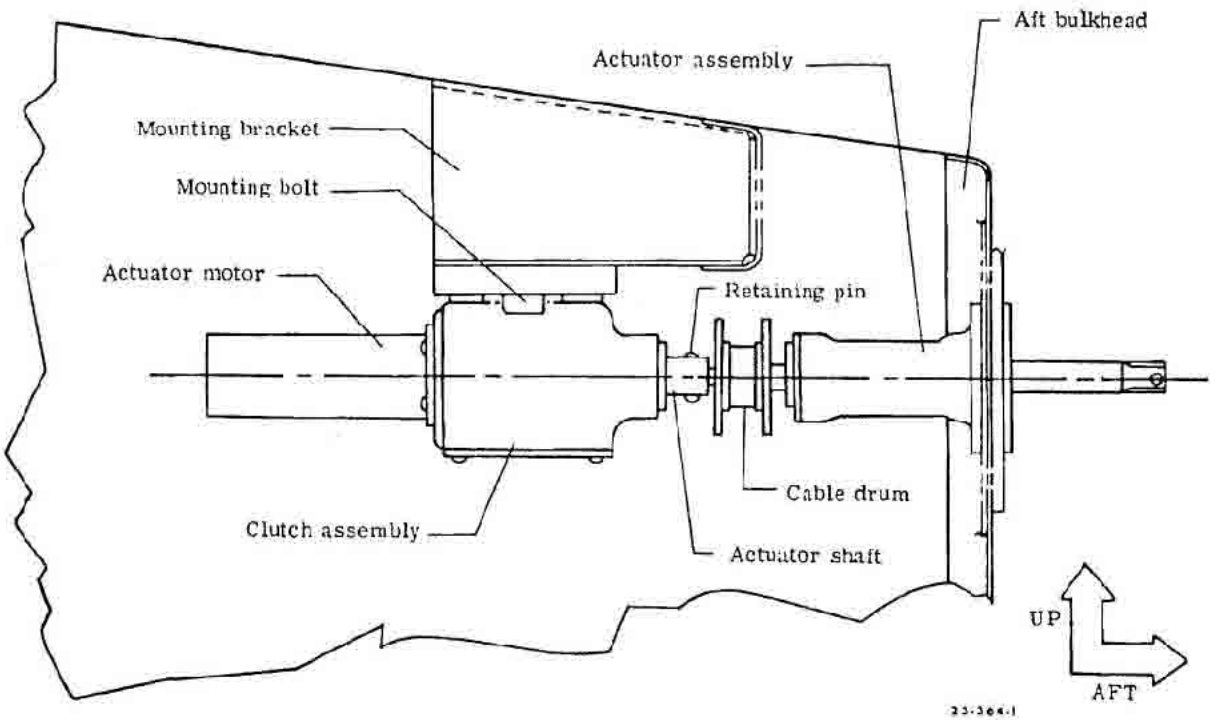


Figure 3-9. Electric Stabilator Trim Tab Actuator Installation

fuselage, just forward of the stabilator.

b. Disconnect the actuator wire harness at the disconnect splices.

c. Remove the pin from the actuator shaft, just forward of the tab cable drum.

d. Remove the three bolts securing the actuator to the bracket. The actuator may now be removed from the aircraft.

ELECTRIC TRIM TAB MOTOR AND CLUTCH ASSEMBLY INSTALLATION

Installation procedure is the reverse of the removal procedure. Tab rigging and cable tension is identical to the manually operated tab.

TRIM TAB ACTUATOR REMOVAL (ELECTRIC AND MANUAL)

a. Remove the access door on each side of the aft fuselage, just forward of the stabilator.

b. Place a clip over the cable drum to prevent the cables from unwinding.

c. Disconnect the cables.

d. Remove the pin from the actuator shaft, just forward of the tab cable drum on aircraft equipped with electric trim tab, and remove the three bolts securing the tab motor and clutch assembly to its support bracket.

e. Remove the tail cone.

f. Remove the two retaining bolts through the aft fuselage bulkhead and lift the actuator out.

TRIM TAB ACTUATOR INSTALLATION

Installation procedure is the reverse of the removal procedure.

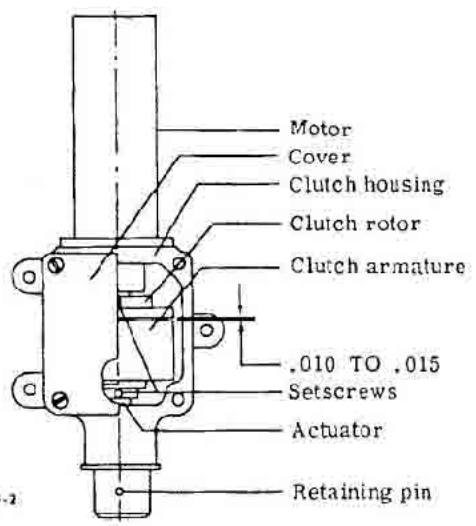


Figure 3-10. Electric Stabilator Trim Tab Actuator

MAGNETIC CLUTCH REMOVAL
(Figure 3-10)

a. Remove the cover from the clutch housing.

b. Loosen the setscrew in the clutch rotor and armature hubs.

c. Remove the motor from the clutch housing.

d. Slide the shaft assembly from the clutch housing.

e. Remove the clutch from the clutch housing.

MAGNETIC CLUTCH INSTALLATION
(Figure 3-10)

Installation procedure is the reverse of removal procedure. No lubrication is required. Tighten the clutch armature setscrew, leaving no visible endplay in the actuator shaft. Slide the clutch rotor on the motor shaft to obtain .010 to .015 inch clearance between the friction surfaces of the clutch before tightening the setscrew. Stake both setscrews. Any time the magnetic clutch is replaced, a static torque check must be performed.

MAGNETIC CLUTCH TORQUE TEST

The following check should be performed any time the magnetic clutch is replaced.

a. Using a 14 VDC power source, connect the red lead of the magnetic clutch to ground and the white lead to the power source. Using a torque wrench, check that the clutch holds with 30 inch-pounds of torque applied at the actuator shaft.

b. If the static torque of the clutch is less than 30 inch-pounds, burn in the clutch as follows:

1. Find a metal plate of sufficient thickness for rigidity and large enough to fit in a vise with the actuator assembly attached. Anchor the plate in a vise and drill three holes in the plate to match the actuator mounting holes. Bolt the actuator to the plate.

2. Insert the retaining pin in the actuator shaft.

3. Slot the end of a tube that will fit snugly into the .375 inch diameter hole in the end of the actuator shaft.

4. Insert the tube into the shaft until the slot engages the retaining pin.

5. Attach the free end of the tube to a slow speed (approximately 450 rpm) half-inch drill motor.

6. Remove the access plate from the clutch housing and blow the housing and clutch clean with compressed air.

7. Using a regulated power source set at seven (7) to eight (8) volts DC, connect the red electrical lead of the clutch to ground and the white lead to the power source with alligator clips.

8. Start the drill motor and unclip the lead to the power source after 15 seconds. Let the clutch cool for approximately one minute before reattaching the lead for another 15 second interval. Repeat the fore-going sequence until the clutch will hold 30 inch-pounds of torque as indicated in step "a" then blow the clutch and housing clean with compressed air.

CAUTION

Exceeding the 15 second burn-in periods may overheat and damage the magnetic clutch.

TRIM TAB CABLE REPLACEMENT

Should it become necessary to replace the trim tab cable, take special notice of the wrapping of the cable on the drum before releasing the cable retaining clip. The cable may then be unwound and the roll pin securing the cable to the drum removed. When installing the new cable, the end having left hand threads is to be routed off the aft side of the drum. With the cable in position in the drum slot, adjust it so the cable end with right hand threads is 3-7/8 inches longer than the left hand threaded end. The roll pin can then be inserted to lock the cable in place.

To wrap the cable on the drum, position the actuator so it is being viewed from above and from the rear, with the slot for the cable on top. Wrap the cable coming off the rear side of the drum 3-1/4 turns clockwise. The cable end coming off the forward side of the drum wraps counterclockwise 3-1/4 turns. The cable retainer clip should then be installed until the actuator is in place and tension is applied to the cables. Rig in accordance with RIGGING THE STABILATOR TRIM TAB SYSTEM.

STABILATOR REMOVAL AND INSTALLATION

a. Remove the inspection plates at the rear of the fuselage. Operate the stabilator to the full up position and support the stabilator tab. Remove the bolt attaching the actuator rod to the stabilator tab.

b. Remove the tail cone attaching screws and remove the tail cone, then remove the bolt and disengage the tab actuator rod at the actuator.

c. Remove the bolt attaching the stabilator control cable to the stabilator actuator rod and remove the two stabilator hinge bolts which will allow the stabilator to be pulled free.

d. Installation is accomplished in the reverse of the removal procedure. Check cable tension and system rig.

NOTE

If the stabilator mounting bolts are AN bolts, torque to 50-70 inch-pounds. When NAS bolts are installed, torque to 90-110 inch-pounds. Add washers as required to reduce side play to .020 ± .010 inch between the fuselage hinge and the stabilator hinge.

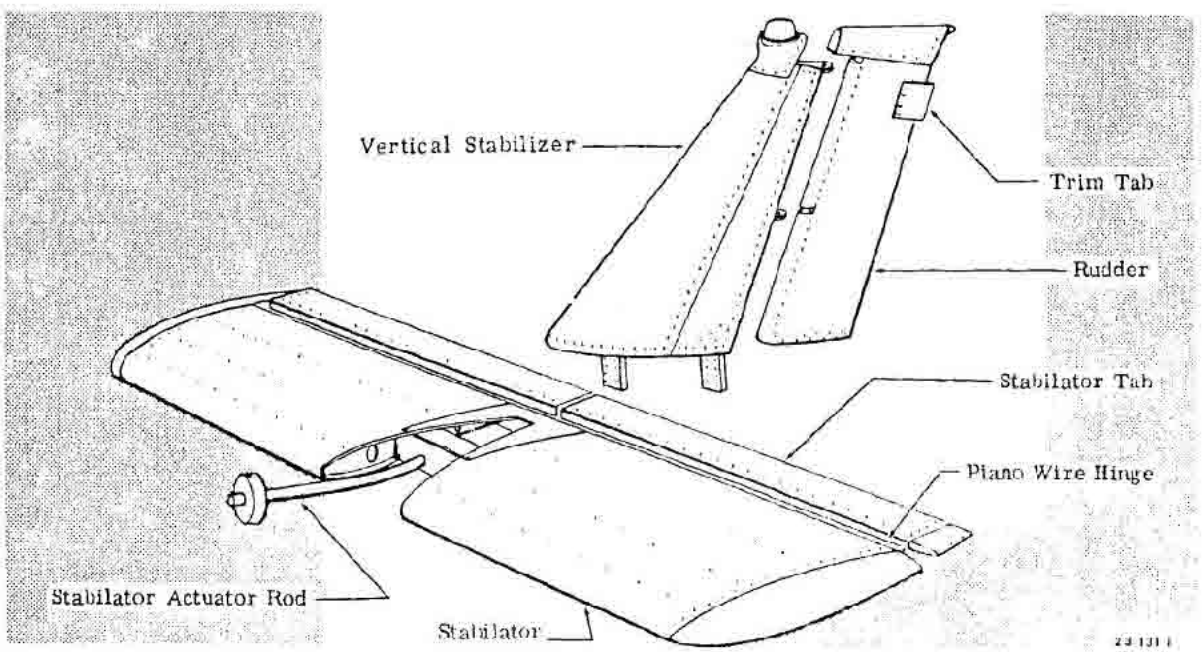


Figure 3-11. Empennage Section

RIGGING THE STABILATOR CONTROL SYSTEM

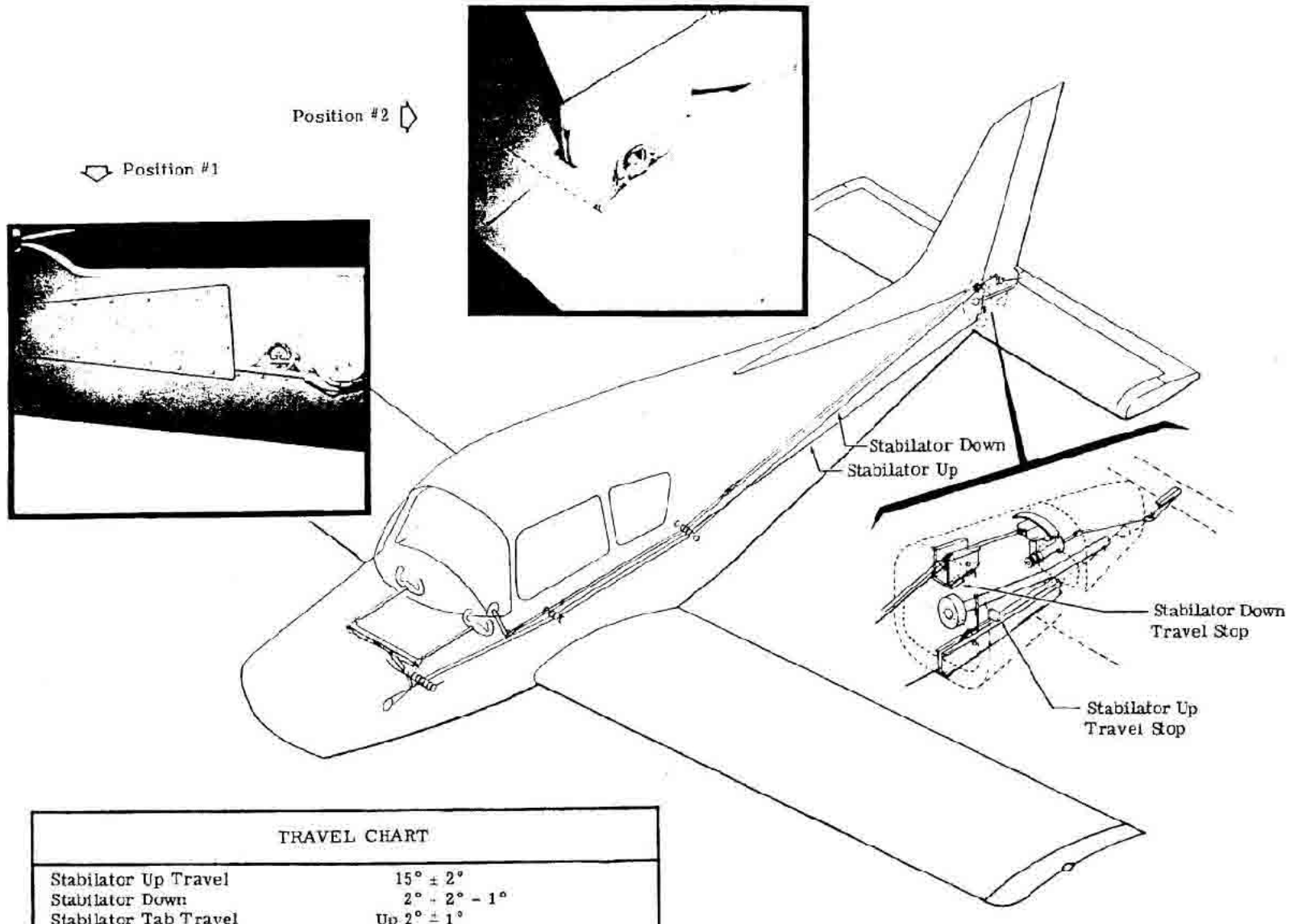
(Figure 3-12)

a. Secure the control column in the neutral position by inserting a 1/4 inch bolt in the rig pin hole in the pilot's control shaft. The neutral position on airplane serials MC-2 thru MC-333 is located .34 inch forward of the rig pin hole. To locate this position, place the control column all the way forward ensuring the stabilator down travel stop is making contact. Mark the pilots control shaft where it comes through the instrument panel and rig the control cable to move the mark .34 inch aft.

b. Adjust the stabilator cable tension as noted on the Cable Tension Temperature Chart.

c. Lock the stabilator in neutral with the appropriate travel board, see SPECIAL TOOLS Section 2. Adjust the stabilator cable turnbuckles to align the mounting hole of the stabilator actuator rod with the connecting link on the stabilator control cable. Install the attaching bolt. Maintain cable tension within correct tolerance and safety turnbuckles with MS20995N40 wire.

d. An alternate method of rigging may be accomplished by using a protractor. Set a protractor vernier



TRAVEL CHART	
Stabilator Up Travel	15° ± 2°
Stabilator Down	2° - 2° - 1°
Stabilator Tab Travel	Up 2° ± 1°
With Stabilator in Neutral	Down 15° + 2° –1°

23-364-3

Figure 3-12. Stabilator Control System

at level with the protractor base on the edge of the skin as indicated by Position No. 1 in Figure 3-12. From the reading, turn the vernier of the protractor 17° clockwise and lock in place. Position protractor on the stabilator as indicated in Position No. 2, Figure 3-12, and rig the cables to tension with protractor bubble centered.

RIGGING THE STABILATOR TRIM TAB SYSTEM

(Figure 3-12)

a. Place the cabin stabilator control wheel indicator in the neutral position.

NOTE

Check stabilator trim tab for excessive play every 100 hours. Maximum acceptable trim tab play, measured at the trailing edge of the trim tab with the stabilator in a fixed position, is .25 inch (.040 inch on MC-2 and after). If excessive play is evident, check the clevis ends of the actuator rod, the bushing in the tab actuator horn, and the actuator rod attach bolts for excessive wear or elongation. Replace parts as required. Check the tab actuator jam nut for proper adjustment and adjust if required.

b. Rig the tab cables to tension as noted on the Cable Tension Temperature Chart.

c. Adjust the actuator shaft to bring the tab into neutral position.

d. Check the tab travel with stabilator in neutral. (See Figure 3-12 for applicable tab travel.)

e. If necessary, fine adjustments may be made with the adjustable tab travel stops located aft of the main spar.

f. Safety turnbuckles with AN995N40 wire.

NOTE

Minimum trim speed (power off, flaps down and tab at the full nose up travel, with hands off) should stabilize below 75 mph. If test flight indicates a higher speed the tab may be adjusted to obtain more down travel.

REMOVAL AND INSTALLATION OF THE RUDDER

a. Remove the inspection plates at the rear of the fuselage and release tension on the rudder cables at the turnbuckles in the aft fuselage.

b. Disconnect the cables from the rudder bellcrank and remove the bolts from the rudder hinge bracket assembly and lift the rudder to clear the pivot point at the top. Disconnect the tail navigation light wires at the quick disconnect and lift the rudder free.

c. Installation is accomplished in the reverse of the removal procedure. See RIGGING THE AILERON/RUDDER SYSTEM.

NOTE

A clearance of 1/4 inch should be maintained between the leading edge skins of the rudder and the trailing edge skins of the vertical stabilizer through full travel. Improper rigging and insufficient clearance may allow the rudder skin to overlap the vertical stabilizer skin and restrict the rudder travel.

REMOVAL OF THE VERTICAL STABILIZER

(Figure 3-13)

a. Place the stabilator in the up position and remove the tail cone.

b. Remove the inspection plates at the rear of the fuselage. Release the tension on the rudder cables in the aft fuselage and disconnect the rudder cables at the bellcrank. Remove the rudder as described in REMOVAL OF THE RUDDER.

c. Remove the screws through the vertical stabilizer. Remove the four bolts through the stabilator cable upper pulley bracket and the front vertical stabilizer spar. Disconnect the stabilator and stabilator tab cables at the turnbuckles just aft of station 181.00 and pull the cables rearward through the front spar of the vertical stabilizer.

d. Remove the bolts securing the stabilator tab actuator to the aft bulkhead, and the bolts securing the electric trim actuator to its support bracket (if installed) and lay the assembly down in the aft fuselage.

e. When removing the vertical stabilizer cut the antenna coaxial cable lead, rotating beacon and tail light navigation wires in the aft fuselage. Secure to prevent retraction into the vertical stabilizer.

f. Remove the attaching bolts at the forward and aft vertical stabilizer spars and remove the vertical stabilizer.

INSTALLATION OF THE VERTICAL STABILIZER

(Figures 3-13, 3-16 and 3-17)

a. Install the coaxial cable connectors P/N UG-88 and UG-89 on the ends of the coaxial cable which were cut on removal.

b. Enlarge the aft electrical lead access hole in the upper aft fuselage (as shown in Figure 3-17) to 9/16 inch diameter.

c. Position the vertical stabilizer in its mounting position. Install the AN4-5A mounting bolts (shown in Figure 3-13) through the forward spar and through the lower mounting holes on the aft spar. Torque bolts to 50-70 inch-pounds.

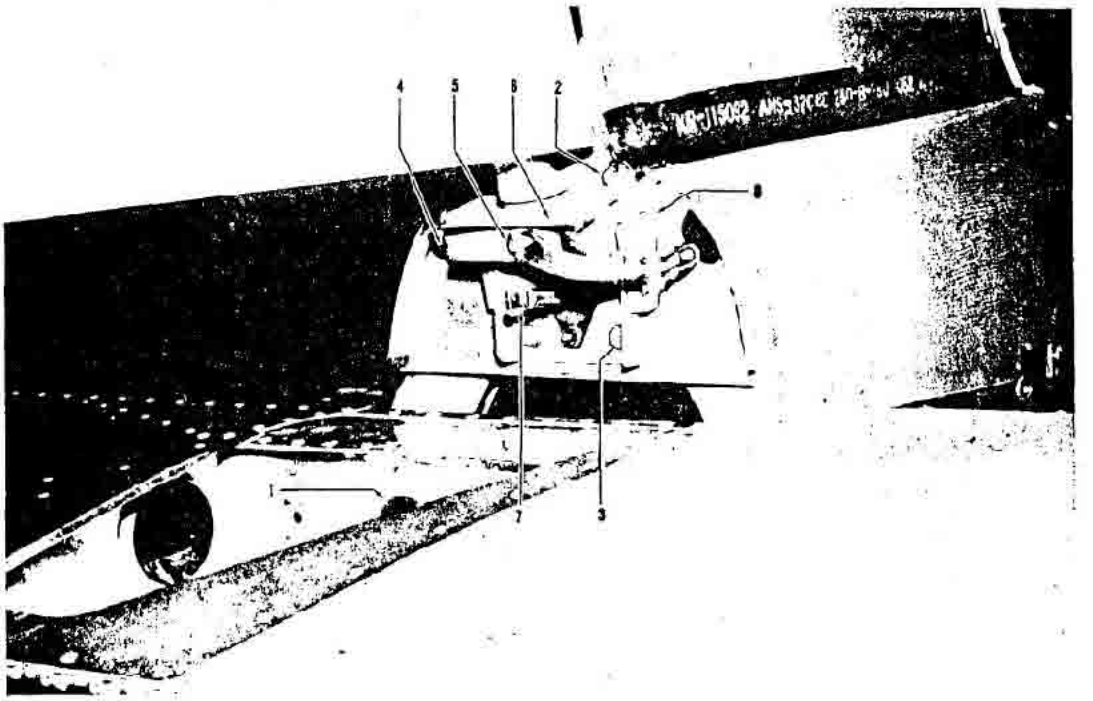
d. Install the four bolts through the stabilator upper pulley bracket and the vertical stabilizer front spar.

e. Splice the ends of the rotating beacon wire and the tail light wire in the aft fuselage using permanent splices (P/N 320559) (See Figure 3-16.)

f. Connect the coaxial cable antenna lead and install an AN931-412 grommet in the hole which was enlarged in step b.

RIGGING THE RUDDER SYSTEM

See RIGGING THE AILERON/RUDDER SYSTEM.



1. Stabilator Control Tube
2. Rear Spar Bolts (AN4-10A)
3. Rear Spar Bolts (AN4-5A)
4. Rudder Bellcrank
5. Taper Pin
6. Rudder Hinge Bracket Assembly
7. Stabilator Tab Actuator
8. Rudder Travel Stops

23-103-1

Figure 3-13. Aft Fuselage

FLAPS

FLAP REMOVAL

a. Disconnect the flap actuator rod assembly at the flap.

b. Remove the bolts from the flap hinge brackets and remove the flap.

FLAP INSTALLATION

a. Position the flap to the wing and install the bolts in the flap hinge brackets. (Rerigging of the flap is not necessary if the actuator rod assembly adjustment is unchanged.)

NOTE

Should there be insufficient clearance between the flap and the upper wing skin with the flaps in the "up" position, clearance may be obtained by lifting up on the skin at the wing trailing edge rivet line.

NOTE

When replacing flap hinge bushings, ring stake the barrel ends of the bushing. DO NOT stake bushing shoulder. A steel tube with one end chamfered to 45° will provide a suitable staking tool. Loose staking or improper bushing installation may cause the flap to move outboard under load and come in contact with the inboard end of the aileron.

The hinge bushing is replaced with a bearing and is staked with a center punch in four places in the hinge bracket on aircraft serials M-555 and after, MA-1 and after, MB-1 and after and MC-2 and after.

RIGGING THE FLAPS

(Figure 3-18)

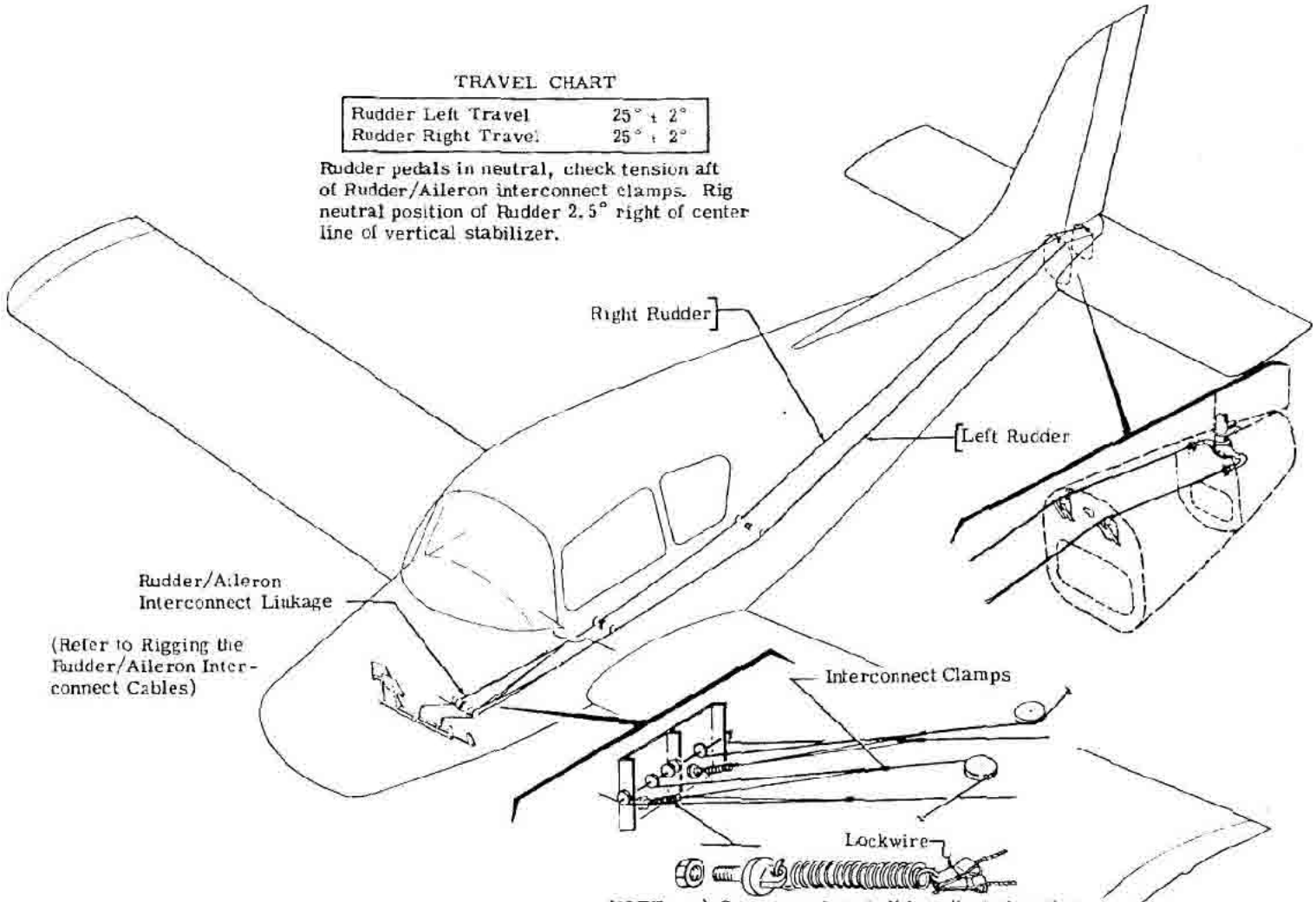
a. Place flap handle in the flap "up" position.

b. For aircraft equipped with stationary stop connect the cable at the turnbuckle below the floor a apply sufficient tension to remove slack from the cable but not to disengage the stop on the torque tube. Then safety

TRAVEL CHART

Rudder Left Travel	25° ± 2°
Rudder Right Travel	25° ± 2°

Rudder pedals in neutral, check tension aft of Rudder/Aileron interconnect clamps. Rig neutral position of Rudder 2.5° right of center line of vertical stabilizer.



NOTE: a) Spring tension shall be adjusted so that the aileron trailing edge moves up a minimum of .38 inch from the neutral position when full corresponding rudder is applied.

b) Spring tension will provide aileron centering.

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Figure 3-14. Rudder Control System M-1 thru M-962, MA-1 thru MA-27

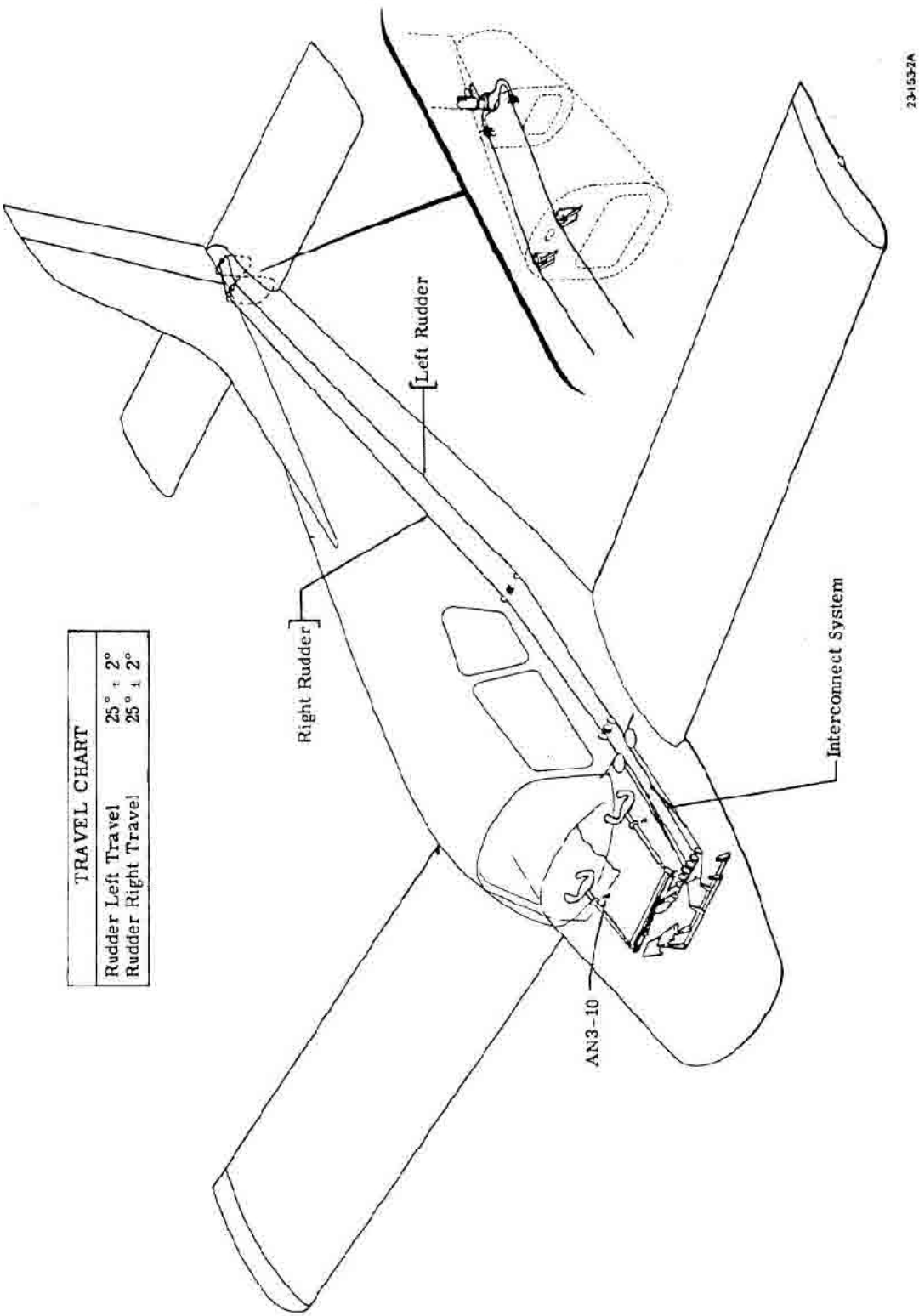


Figure 3-15. Rudder Control System M-963 and after, MA-28 and after, MB-1 and after, MC-2 and after

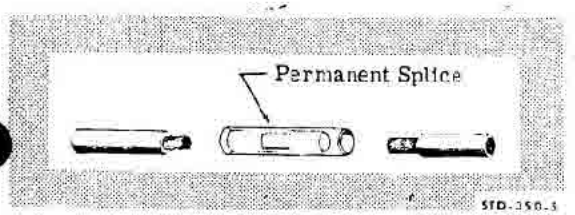


Figure 3-16. Wiring Splicing

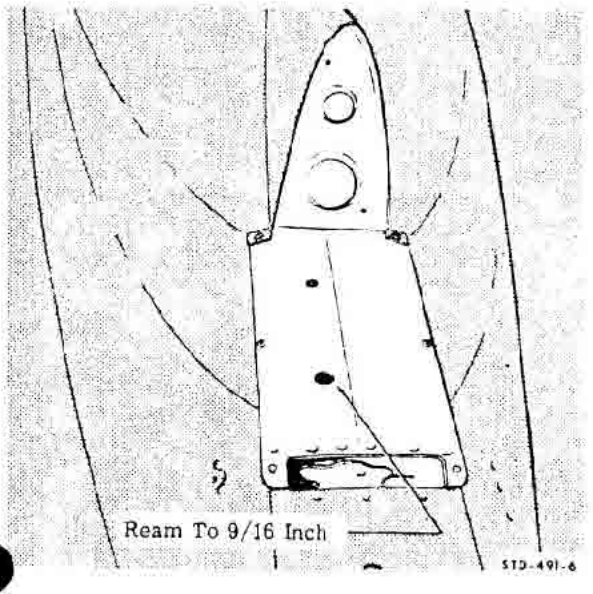


Figure 3-17. Reaming Coaxial Cable Access Hole

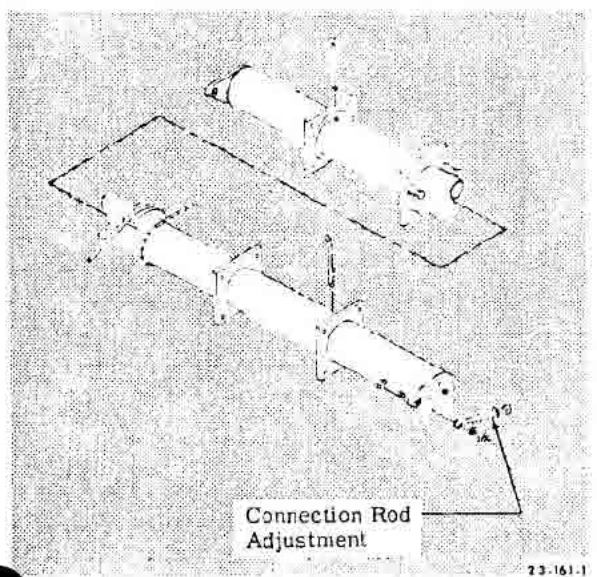


Figure 3-18. Flap Control Adjustment

the turnbuckle. For those aircraft having adjustable stops, effective with M-1307 and after, MB-498 and after, and MC-78 and after, adjust the turnbuckle to take out all slack in the cable, then adjust the up-stop to contact the fixed stop on the torque shaft without creating any additional slack in the cable.

c. Place flap handle in the "full down" position.

d. Connect the flap actuator rod assembly at the flap end next to the fuselage.

e. Position the flap handle to the "flap up" position. Check flap travel with a flap travel board P/N 169-110000-1 & -2/807, Model 23, or a flap travel board P/N 169-160005/807, serials M-555 and after, MA-1 and after, MB-1 and after and MC-2 and after, or set a protractor vernier at level with the protractor base placed approximately midway between the flap ends. Center the protractor on the top flat surface, record the reading in degrees, remove the protractor and move the flap to the down position.

f. Place the protractor on the flap and set as described in step e. The difference between the two readings should be 30° ± 1° (M-1 through M-554) and 35° ± 1° (M-555 and after, MA-1 and after, MB-1 and after and MC-2 and after.

NOTE

On aircraft having fixed stops on the torque tube and keel, it is not necessary to hit the down stop for the 30° and 35° flap positions.

g. To adjust the degree of flap travel, position the flap in the down position and remove the flap actuator rod assembly from the flap root end. Adjust the rod end of the flap actuator assembly as necessary to obtain the required travel.

h. Connect the flap actuator rod assembly to the flap root end and tighten the rod assembly lock nut.

i. On serials M-1307 and after, MB-498 and after, and MC-78 and after, the adjustable down stop may then be adjusted to contact the fixed stop on the torque shaft.

Serials M-555 and after, MA-1 and after, MB-1 and after, and MC-2 and after have an external up stop for each flap. The stop is installed just forward of the flap outboard hinge. When properly adjusted, the stop exerts additional pressure in conjunction with the force applied by the internal stop on the flap torque tube to help prevent vibration and metal fatigue. Adjust the flap stop as follows:

Screw the adjustable stops out to where the flaps strike them at the same time or slightly before the travel up stop on the flap torque tube is hit. When adjustment is correct, tighten lock nut.

ELECTRIC FLAP

The electrical flap jackscrew assembly, actuator motor and flap position transmitter (M-1236 and after, MA-351 and

after, MB-433 and after and MC-2 and after) are located under the floor and aft of FS 132.00. Located on the left torque tube is a micro switch cam and position cam. Power is sent to the flap motor when the flap switch is placed in either the "UP" or "DOWN" position. The flap motor drives the flap jackscrew assembly which in turn rotates the torque tubes, moving the flaps up or down. The movement of the torque tube also moves the flap position cam and micro switch cam. The flap position transmitter arm follows the curve of the position cam and causes the transmitter to send a signal to the flap indicator in the cockpit, showing the position of the flap. The micro switch cam operates two micro switches which limits the travel of the flap in either the up or down travel. There is an external up stop for each flap. The stop is installed just forward of the outboard flap hinge and when properly adjusted, exerts additional pressure in conjunction with the force applied by the internal stop on the flap torque tube and prevents the effects of vibration on the flap bearings and structure.

RIGGING THE ELECTRIC FLAPS
(M-1 thru M-1350, MB-1 thru MB-506, MC-2 thru MC-95)

a. In the event the adjustable linkage at the inboard end of the flaps has been changed in any way, check the linkage length and adjust to obtain 5-3/32 inches on center of the rod ends.

b. Disconnect the actuator jack screw from the torque shaft by removing the bolt and spacer at the aft end of the jack screw. Reinstall the spacer and bolt between the arms on the torque shaft and by grasping the trailing edge of the flap, move the flaps to the up position.

c. Place a bubble protractor on the wing trailing edge near the center of the flap and adjacent to a wing rib and center the bubble. Rotate the vernier clockwise 3° from the reading taken from the wing. Place the protractor on the flap directly aft of the position from which the wing reading was taken.

d. Further adjust the flap linkage at the inboard end to center the bubble with the flaps against the up stop. Aircraft serials M-1302 thru M-1350, MB-492 thru MB-506 and MC-75 thru MC-95 have adjustable internal travel stops. With the linkage at the inboard end of the flap adjusted to 5-3/32 inches, move the flaps to the up position and adjust the internal stops to center the protractor bubble with the protractor set at the 3° clockwise setting derived from the original reading taken from the wing.

e. Adjust the up limit switch to actuate .25 to .37 inch before the stop is contacted. The down limit switch should be set to actuate .25 to .37 inch before the stop is contacted. The down limit switch should be set to actuate .25 to .37 inch before 35° of flap travel is reached. It is not necessary that the fixed stop be contacted by the stop on the torque shaft.

f. Connect the jack screw to the torque shaft with the original spacer and bolt.

g. Operate the flaps intermittently in both directions before a normal operation is attempted. Check travel of flaps with normal electric operation. Minor adjustments of the flap linkage and switches may be necessary to obtain the desired travel.

NOTE

See SPECIAL TOOLS Section 2 for the appropriate travel board to adjust the linkage at the inboard end of the flap to obtain the desired travel, then adjust the limit switches as described above.

h. Adjust the external stops on the outboard flap hinges to make contact at the same time or slightly before the internal stop makes contact.

(M-1351 and after, MB-507 and after and MC-96 and after)

A dynamic brake relay is incorporated in the electric flap circuitry on the above noted aircraft serials and may be rigged as follows:

a. In the event the adjustable linkage at the inboard end of the flaps has been changed in any way, check their length and adjust to obtain 5-3/32 inches on center of the rod ends.

b. Disconnect the actuator jack screw from the torque shaft by removing the bolt and spacer at the aft end of the jack screw. Reinstall the spacer and bolt between the arms on the torque shaft and by grasping the trailing edge of the flap, move the flaps to the up position.

c. With a bubble protractor positioned on the wing trailing edge near the center of the flap and adjacent to a wing rib, center the bubble. Rotate the vernier clockwise 3° from the reading taken from the wing and place the protractor on the flap directly aft of the position on the wing trailing edge where the first reading was taken.

d. Adjust the up stop on the torque shaft to center the protractor bubble.

e. Lower the flaps and adjust the down stop on the torque shaft to obtain 35° ± 1° from the reading taken with the flap in the up position. Minor adjustments of the linkage and stops may be required.

f. Rig the up and down limit switches to actuate as the adjustable stop is contacted.

g. Connect the actuator jack screw to the torque shaft with the original bolt and spacer.

h. Operate the system electrically to determine that excessive stress is not being applied to the stops. Minor adjustments of the switches and flap linkage may be required to obtain the desired travel.

i. Adjust the external stops on the outboard flap hinges to make contact at the same time or slightly before the internal up stop makes contact.

NOTE

See SPECIAL TOOLS Section 2 for the appropriate travel board to adjust the linkage at the inboard end of the flap to obtain the desired travel, then adjust the limit switches as described above.

BALANCING THE CONTROL SURFACES
(Figure 3-19)

All control surfaces (except flaps) should be rebalanced

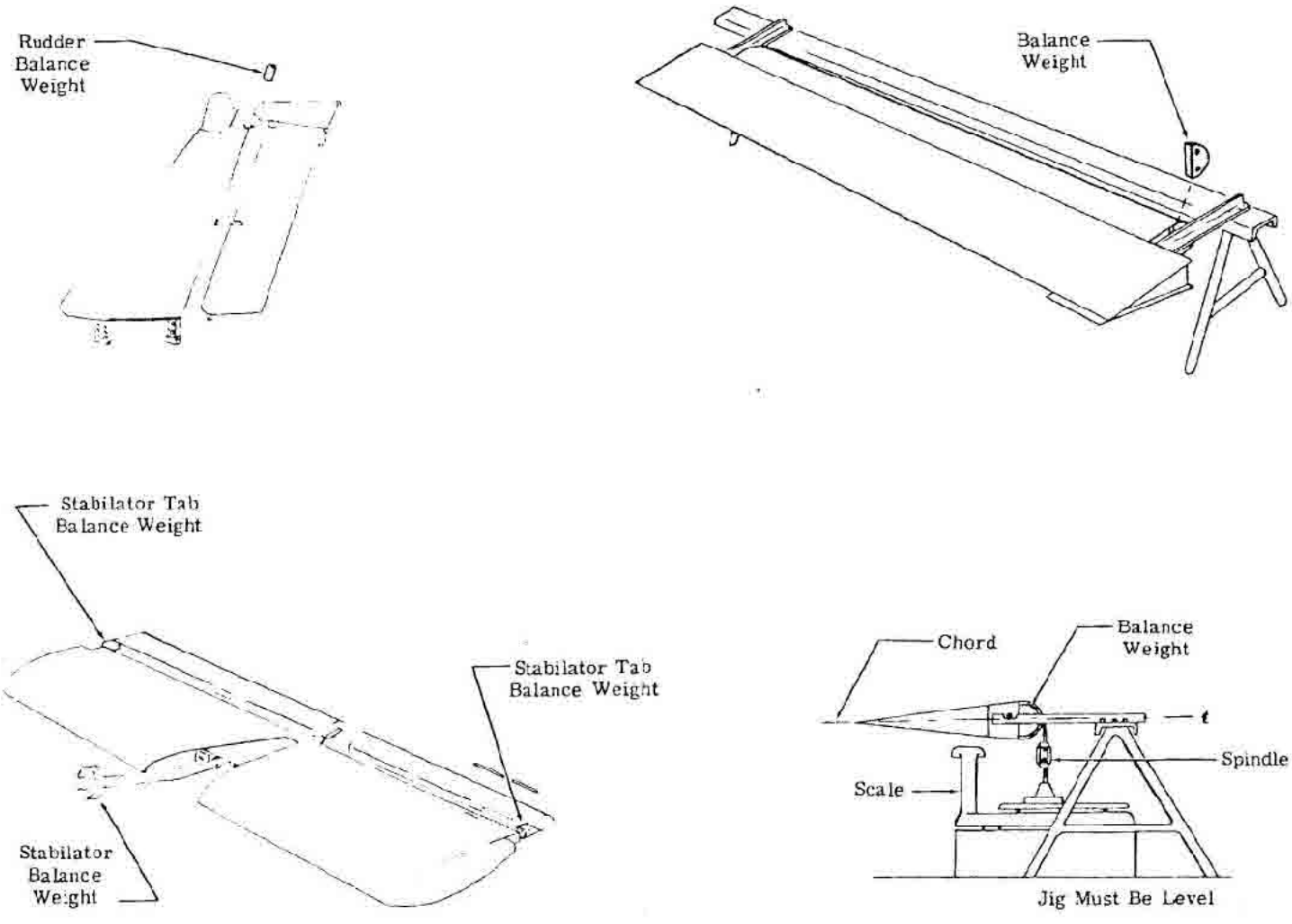


Figure 3-19. Balancing the Control Surfaces

after repainting, repairs, or replacement of parts. When rebalancing the control surfaces follow the general procedure as outlined below.

a. Prior to placing the control surfaces in a balancing jig, locate the chord line as follows:

1. Aileron - Place one end of a straight edge on the center line of the inboard hinge and center the other end of the straight edge on the aileron trailing edge; mark the chord line on the rib at the inboard end of the aileron with a grease pencil.

2. Rudder, Stabilator, or Stabilator Tab - Mark line from the midpoint on the leading edge to the trailing edge.

b. Place the control surface in a balancing jig permitting it to rotate freely about the hinge line.

c. Place a small platform scale under the trailing edge of the control surface (if balancing requirements necessitate a tail heavy condition), or under the leading edge (if balancing requirements necessitate a nose heavy condition).

d. Place a spindle of known weight on the scale and adjust it until the chord line of the control surface is in a horizontal position as checked with a bubble protractor. Make sure that the spindle remains perpendicular with respect to the horizontal chord line of the control surface.

e. Check the scale and note the total weight of the spindle and that portion of the control surface supported by the spindle. Measure in inches the distance from the hinge center line to the point where the spindle supports the edge of the control surface.

f. Substitute into the following formula the values obtained in the preceding steps:

Amount of Nose or Tail Heaviness in inch-pounds = D(W-S)

D = Distance in inches from the hinge center line to the point where the spindle supports the control surface.

W = Total weight in pounds of the spindle and that portion of the control surface supported by the spindle.

S = Weight in pounds of the spindle.

g. Using the above formula, determine if the control surface is within the specified balance limitations; add weight as required until the proper balance is attained.

The following procedures should be followed to modify the balance weights in order to bring each control surface within the balance limitations.

a. The balance requirements for a painted aileron, including hinges, fixed tabs, and static discharge wicks (if applicable), is NOT tail heavy but may be nose heavy to the extent that a lead counterweight of .95 pounds maximum will create. All weight additions or reductions should be made by modifying the lead weight that is secured with screws to the rib on the outboard end of the aileron. To add weight use mold or laminated sheet stock to fabricate a larger lead balance weigh: (not to exceed .90 ± .05 lbs.)

b. The balance requirements for a painted rudder, including hinges, bellcrank, clearance light, and static discharge wicks (when applicable) should not exceed 20.00 inch-pounds tail heavy. To increase weight in order to bring the rudder into proper balance, the following method is recommended:

1. Drill and tap holes so that coarse threaded screws can be inserted into the cavity of the aluminum casting.

2. Add lead washers as required until the rudder is properly balanced. The modified balance weight must not exceed 1.0 ± .05 pounds.

c. The balance requirements for a painted stabilator tab, including static discharge wicks (when applicable) should not exceed 4.60 inch-pounds tail heavy. To increase the balance weight proceed as follows:

1. Pattern to the existing balance weights sufficient quantities of lead sheet stock to bring the stabilator tab within the required balance weight limitations. No single balance weight to exceed 1.5 + .10 - .00 pounds.

2. Attach the added lead to the existing balance weights with 3/16 inch bolts.

d. The balance requirements for a painted stabilator, including hinges, tab, tab control rod, and static discharge wicks (when applicable) should not exceed 25.00 inch-pounds tail heavy.

NOTE

A balanced stabilator tab must be installed on the stabilator before the stabilator itself can be balanced.

To increase the balance weight, proceed as follows:

a. Add lead sheet stock to the aft side of the stabilator balance weight. Maximum weight, prior to airplane serial M-573, should not exceed 10.5 + .20 - .00 pounds. On serials M-574 through M-1285, MA-1 through MA-361 and MB-1 through MB-480, the maximum weight should not exceed 11.5 + .20 - .00 pounds. Serials M-1286 and after, MA-362 and after, MB-481 and after and MC-2 and after, the maximum weight should be 10 lbs. 12 oz. to 11 lbs.

BEECHCRAFT NEW-MATIC AUTOPILOT

The BEECHCRAFT New-matic autopilots operate on an electro-pneumatic concept. Electronic circuitry is used for navigational beam detection, magnetic heading direction and turns. Pneumatic servos are used for the flight control actuators. The systems are completely non-tumbling. Yaw, roll and turn detection is made by a tilted gyro (EVT turn coordinator electrical vacuum torquing combination) mounted in the instrument panel. A dampened miniature aircraft serves as the instrument indicating arm. Any deviation from straight flight causes the rate gyro to move a vacuum valve which puts force into the aileron or rudder to return the aircraft to straight flight. Turns or beam following is made by rotating a valve sleeve by a torquing movement proportional to the voltage imposed upon it. This unit also supplies an output voltage proportional to the turning rate that is used for dip compensation and nose up signal during turns. The pitch control system does not use a gyro for reference, but uses the airspeed, rate of airspeed change and inertial signals to control the elevator through the pitch servos. An altitude hold sensing unit works in conjunction with the pitch control to sustain a given altitude.

AUTOPILOT TROUBLESHOOTING GUIDE

NOTE

This procedure applies specifically to the BEECHCRAFT New-matic autopilots. Manuals noted in the Supplementary Publications list and the appropriate test sets as listed in those manuals will aid further in troubleshooting procedures.

INDICATION	*PROBABLE CAUSE*	*REMARKS*
ROLL AXIS		
1. Insufficient or excessive vacuum indicated on aircraft system gage.	a. Leak in aircraft vacuum system.	a. Check all lines and fittings for breaks, looseness, kinks, etc.
	b. Regulator valve improperly adjusted.	b. Adjust as outlined in Section 2.
	c. Adjustable regulator improperly adjusted	c. Adjust as outlined in Section 2.
	d. Faulty vacuum pump.	d. Replace pump.
	e. Ambient air filter clogged.	e. Clean or replace.
	f. Clogged system filter.	f. Check as outlined in Section 2 and replace if necessary.
2. Aircraft hunts or recovers slowly from turn in one direction.	a. Regulator valve improperly adjusted.	a. Adjust as outlined in Section 2.
	b. Loose aircraft primary cables or excessive friction in aileron and/or rudder cables, pulleys, bellcranks or loose servo cables.	b. Check security of attachment, binding, etc. and adjust as outlined in Section 3.

	INDICATION		PROBABLE CAUSE		REMARKS
		c.	Leak in servo or servo lines.	c.	Check for leaks.
		d.	Obstruction in servo lines.	d.	Check for foreign matter.
		e.	Faulty turn coordinator gyro.	e.	Replace turn coordinator.
3.	Autopilot sluggish.	a.	Low system vacuum setting.	a.	Check system filters and adjust as outlined in Section 2.
4.	Aircraft turns continuously on basic stabilization. (Controller "OFF")	a.	Aircraft out of trim or improperly rigged.	a.	Trim aircraft or check controls for proper rig as outlined in Section 3.
		b.	Loose primary cables or excessive friction in cables and system. Loose servo cable.	b.	Check security of attachment, binding, etc. and adjust as outlined in Section 3.
		c.	Defective turn coordinator gyro.	c.	Replace turn coordinator gyro.
		d.	Leak in servo or servo line.	d.	Check for servo or line leaks.
5.	Aircraft rate of turn too fast or too slow.	a.	Improper regulator adjustment.	a.	Adjust regulator as outlined in Section 2.
		b.	Turn coordinator faulty.	b.	Replace turn coordinator.
6.	Continuous control wheel oscillation in smooth air.	a.	Turn coordinator faulty.	a.	Replace turn coordinator.
		b.	Improper gyro speed or excessive vacuum in system.	b.	Adjust system as outlined in Section 2.
7.	No turns or turns in one direction only, in response to turn control or on all modes of navigation coupler operation.	a.	Faulty turn coordinator.	a.	Replace turn coordinator.
		b.	Faulty controller amplifier.	b.	Replace controller amplifier.
8.	Aircraft rolls in one direction only either left or right.	a.	Servos improperly phased.	a.	Plumb as noted on Figure 3-21.
		b.	Turn coordinator not plumbed properly.	b.	Plumb as noted on Figure 3-21.
9.	Aircraft turns in the wrong direction in "CAP" and "TRK" modes.	a.	Nav input signal reversed.	a.	Reverse connectors to VOR.
10.	No aircraft response from navigation coupler in any mode, ground check shows electrical.	a.	Faulty turn coordinator gyro.	a.	Replace turn coordinator.
		b.	Obstruction in vacuum lines.	b.	Check for foreign matter.
11.	Aircraft fails to turn to and hold magnetic headings.	a.	Faulty magnetic heading sensor.	a.	Replace magnetic heading sensor.

INDICATION	PROBABLE CAUSE	REMARKS
	b. Faulty heading selector resolver.	b. Replace controller amplifier.
	c. Faulty controller amplifier.	c. Replace controller amplifier.
12. Magnetic headings consistently high or low.	a. Heading sensor misaligned in aircraft.	a. Check for proper installation.
	b. Heading azimuth dial shifted on shaft.	b. Tighten screw and recalibrate.
	c. Improper adjustment of controller amplifier.	c. Calibrate for the magnetic cardinal points.
13. Cardinal headings inaccurate.	a. Controller amplifier improperly adjusted.	a. Calibrate for the magnetic cardinal points.
	b. Leak in servo system.	b. Check for leaks.
	c. Low primary vacuum.	c. Adjust system as outlined in Section 2.
14. Cardinal headings accurate but intermediate headings inaccurate.	a. Faulty heading sensor.	a. Replace the heading sensor.
	b. Faulty controller amplifier.	b. Replace controller amplifier.
15. Insufficient or no control in "CAP" and "TRK" modes.	a. Faulty controller amplifier.	a. Replace controller amplifier.
	b. Faulty omni converter.	b. Replace omni converter.
	c. Insufficient signal from omni.	c. Repair or replace omni indicator.
	d. "NAV SENS" improperly adjusted.	d. Readjust.
16. Localizer approach is either sluggish or too sensitive.	a. Localizer gain is set high or low.	a. Adjust localizer gain.
17. No electrical output left or right on controller amplifier test jacks.	a. No A+ input or improperly grounded.	a. Check A+ and ground.
	b. Defective controller amplifier or power supply.	b. Replace controller amplifier or power supply.
18. Output only one way on controller amplifier test jacks.	a. Defective controller amplifier.	a. Replace controller amplifier.
19. No output on HDG mode on controller amplifier test jacks.	a. Defective controller amplifier, or harness, or heading sensor.	a. Replace controller amplifier; or harness, or heading sensor.
20. Heading output on two reciprocal headings, but not on the other two.	a. Defective sensor; or harness; or faulty controller amplifier.	a. Replace heading sensor, or check harness. Replace controller amplifier.

INDICATION	PROBABLE CAUSE	REMARKS
21. "0" output when in CAP, TRK, or APP mode with nav signal.	a. Defective nav switching console; or no nav information; or defective controller amplifier.	a. Check nav input leads. Replace controller amplifier.
22. Output voltage in CAP mode decays to "0" voltage.	a. Wrong nav input signals.	a. Check wiring.
	b. Defective switching console (if installed.)	b. Repair or replace console.
	c. Dirty input signal (AC volts).	c. Check indicators.
23. Voltage output in MAN, CAP, TRK, and APP mode, but none in HDG mode.	a. Polarization pins reversed on heading sensor plug.	a. Reverse pins. (See Figure 3-21.)
24. Nav indicator needle deflects left or right when controller amplifier or radio is turned on.	a. One of the components is shorted to ground.	a. Check for shorts.
25. Low or high intercept angle.	a. Incorrect setting on controller amplifier.	a. Adjust intercept angle.
	b. Low or high voltage output on nav indicators.	b. Check nav indicators to manufacturer's specs.
PITCH AXIS		
1. Pitch channel will not center up electrically.	a. Defective pitch/altitude sensor or amplifier.	a. Check on Test Set TS-108 or replace one at a time.
2 Altitude channel will not center up electrically	a. Defective pitch/altitude sensor or amplifier.	a. Check on Test Set TS-108 or replace one at a time.
3. Altitude hold solenoid valve will not actuate.	a. Switch on servo control valve out of circuit.	a. Check for faulty switch and replace if necessary.
	b. Defective solenoid valve	b. Replace solenoid valve.
	c. Defective altitude switch on controller amplifier.	c. Check continuity (see Figure 3-21).
4. Servo control valve will not center.	a. Improper vacuum adjustment.	a. Adjust as outlined in Section 2.
	b. Sticky valve.	b. Replace valve.
5. Output voltage is inadequate.	a. Pitch/altitude amplifier sensor or harness shorted or improperly wired	a. See Figure 3-21; run continuity check and check for shorts.
6. Output voltage one way only on pitch and altitude channels.	a. Servo control valve shorted to ground.	a. Replace valve.

INDICATION	PROBABLE CAUSE	REMARKS
7. System will not maintain trimmed configuration even though centered electrically.	a. Servo control valve not pneumatically centered.	a. Disconnect electrical power. Center valve pneumatically by use of differential gage to ± 0.4 in. Hg.
	b. Leak in servos or improperly rigged.	b. Check for leaks and rig.
	c. Leak in pitch/altitude sensor.	c. Replace sensor.
8. System will not respond to airspeed changes.	a. Primary vacuum not set properly.	a. Adjust as outlined in Section 2.
	b. Pitot pressure inadequate.	b Check pitot plumbing.
	c. Decay rate improperly adjusted.	c. Adjust as required.
9. System will not respond to up-command adjustment.	a. Defective pitch altitude amplifier.	a. Replace pitch/altitude amplifier.
	b. No EVT potentiometer output.	b. Replace turn coordinator.
10. System will not respond to altitude gain adjustment.	a. Pitch altitude amplifier limiter improperly set.	a. Adjust as required.
11. Aircraft has long term oscillation about pitch axis with altitude hold OFF.	a. Decay rate improperly adjusted.	a Adjust as required.
	b. Pitch altitude gain improperly adjusted.	b. Adjust as required.
	c. Friction in elevator or servo system.	c Check for friction and correct.
12. Aircraft has short term oscillation about pitch axis.	a. Decay rate too tight.	a. Adjust as required.
	b. Pitch gain too high.	b. Adjust as required.
	c. Primary vacuum too high.	c. Readjust as outlined in Section 2.
13. Aircraft oscillates with altitude hold ON.	a. Altitude gain too high.	a. Adjust as required.
	b. Decay rate improperly adjusted.	b. Adjust as required.
14. Aircraft does not return to altitude when displaced.	a. Altitude hold solenoid inoperative.	a. Replace solenoid.
	b. Leak in altitude system.	b. Check for leaks.
	c. Altitude limiter improperly adjusted.	c. Adjust as required.

INDICATION	*PROBABLE CAUSE*	*REMARKS*
15. Aircraft descends or ascends continually when system engaged.	a. Servo control valve not phased correctly.	a. Apply positive 6.0 volts (max) to blue lead and verify nose up response.

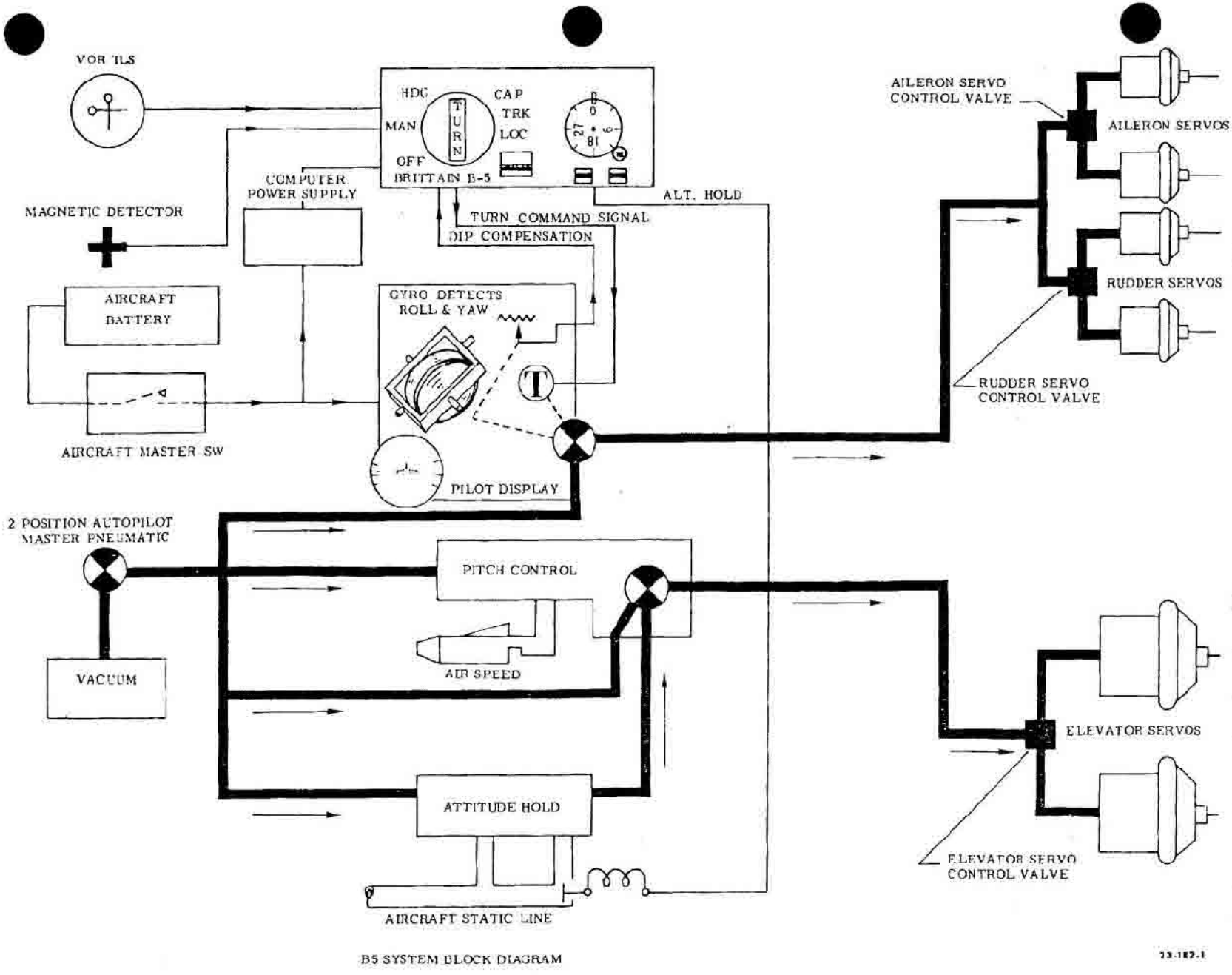


Figure 3-20. BEECHCRAFT New-Matic B5 Autopilot System

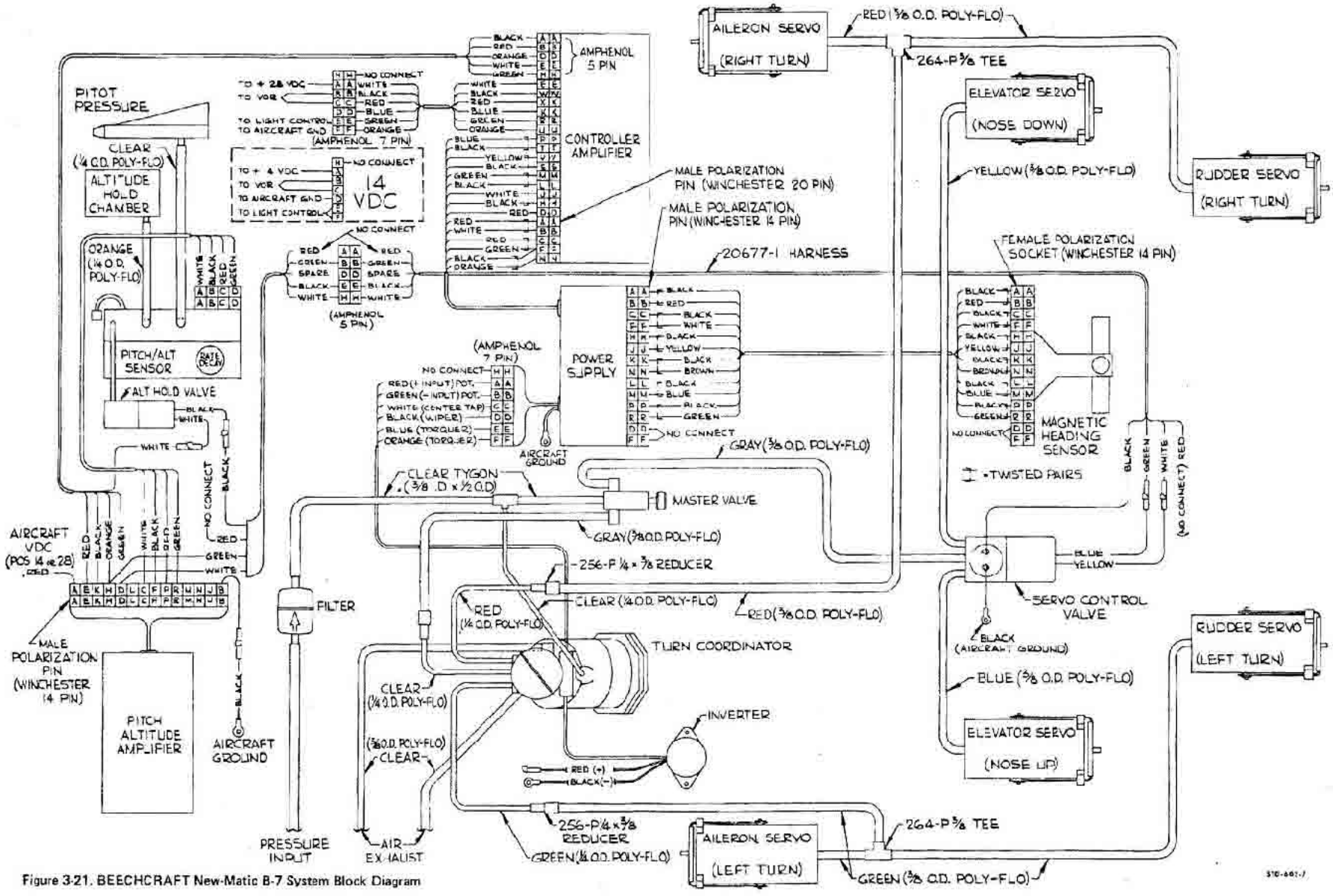


Figure 3-21. BEECHCRAFT New-Matic B-7 System Block Diagram

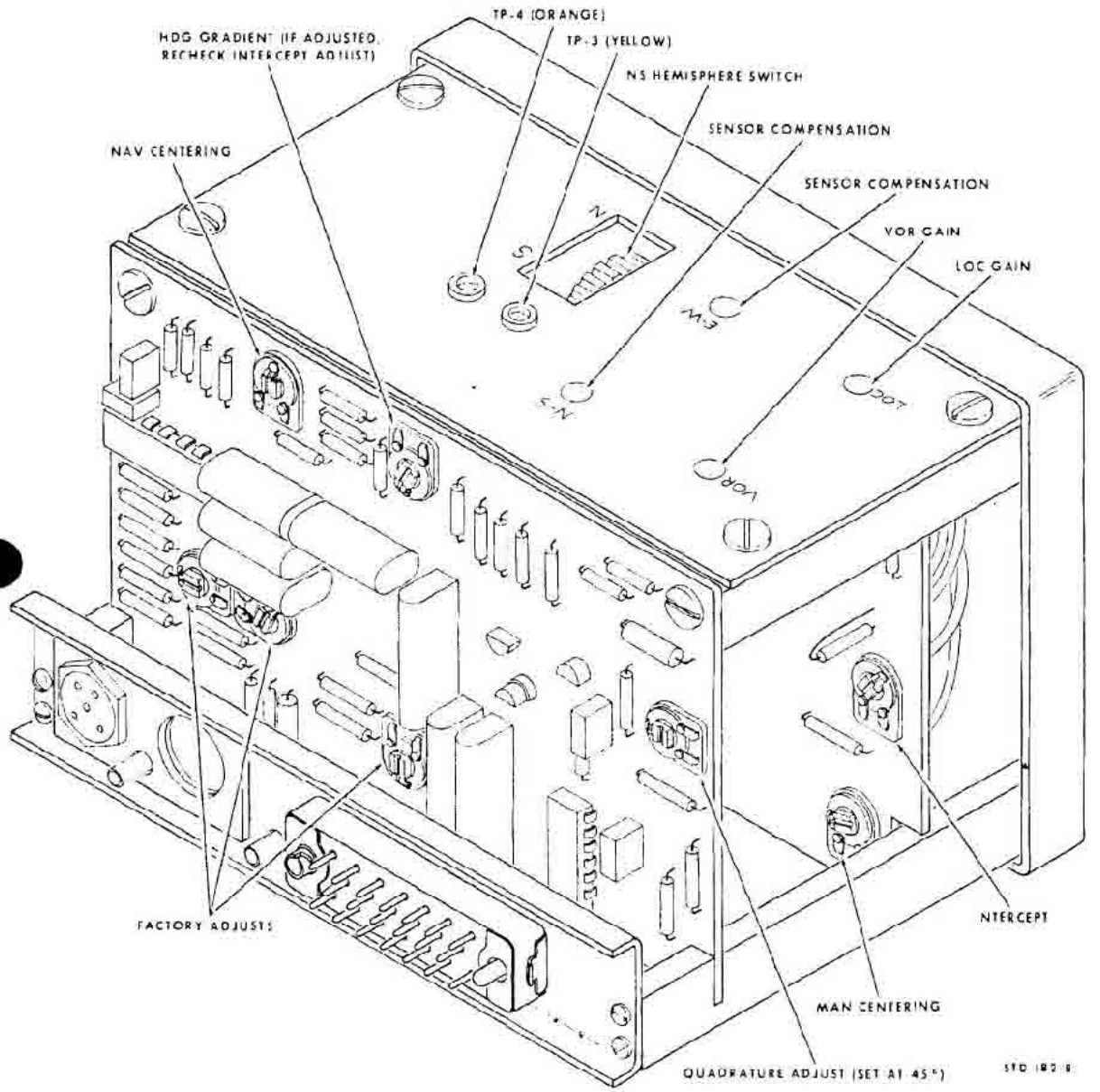


Figure 3-22. BEECHCRAFT B5 and B7 Heading Lock/Navigation Coupler System Adjustment Points

STROBE LIGHT SYSTEM

Pulsating strobe lights mounted on the wing tips greatly increase the visibility of the aircraft during night flight. A select switch in the LH subpanel actuates the strobe light system. The strobe lights are powered by a power supply unit mounted adjacent to the battery on the RH side of the fuselage directly aft of the baggage compartment. A transistorized circuit in the 14 volt power supply unit steps up the voltage of the aircraft electrical system to the level (approximately 450 volts) required to operate the strobe lights. The stepped-up voltage is stored in a capacitor until released to the strobe lights. The current from the power supply unit is conducted to the flashtube of the strobe light by a specially shielded power cable. A charge of high voltage electricity is momentarily released to a coil in the flashtube assembly. The coil further steps up the charge to a point where it ionizes the xenon gas in the flashtube. The high voltage stored in the capacitator then surges through the gas to produce the brilliant burst of energy that characterizes the strobe light. When the capacitator voltage drops sufficiently, the lamp will go out while the capacitator begins recharging for the next cycle. This operational cycle will be repeated until the strobe light is turned off.

POWER SUPPLY UNIT REMOVAL AND INSTALLATION

To gain access to the power supply unit, remove the door in the rear panel of the baggage compartment. The entire unit may be removed by disconnecting the electrical wiring to the power supply and removing the screws anchoring the module to the support structure. To reinstall the power supply unit, reverse the foregoing procedures.

CAUTION

Observe the precautions noted in the following procedure when removing and installing the power supply unit.

STROBE LIGHT WIRING

An incorrect hook-up of the wires in either the power input or between the strobe light assemblies and the power supply unit will cause a reversal of polarity that results in serious component damage and failure. Care must be taken to ensure that the red wire is connected to positive power and the black wires are connected to ground. The shields for the wing light cables are grounded to the aircraft structure. Refer to the Wiring Diagram for the system in Section 4 to ensure a correct hook-up of the components in the strobe light system.

WARNING

Although a bleed-off resistor is incorporated in the power supply circuit, high voltage is involved in the circuit between the power supply and the light assemblies. For this reason, turn the control switch for the strobe lights OFF and wait for at least 10 minutes to elapse before disconnecting the cables at the power supply or light assemblies and before handling either of these units in any way. Failure to observe these precautions may result in physical injury from electrical shock.

REMOVAL AND INSTALLATION OF THE WING STROBE LIGHTS

CAUTION

To avoid damage to the strobe light system or possible physical injury from electrical shock, observe the precautions outlined under STROBE LIGHT WIRING before removing or installing the strobe light assembly.

a. Remove the 3 screws securing the strobe light in place.

b. Lift out the light assembly and disconnect the electrical wiring.

c. Remove the light assembly. Remove the lens and replace the flashtube or light as required.

d. Reverse the preceding steps to reinstall the light assembly.

LANDING GEAR SYSTEM

FIXED LANDING GEAR

REMOVAL OF THE MAIN LANDING GEAR

a. Cradle the wing assembly on a suitable wing support stand under the main spar and outboard of the landing gear.

b. Remove the fairing attaching screws and lower the fairing on the main gear. Drain the brake system and disconnect the hydraulic brake fluid line at the lower wing skin.

c. Support the landing gear and remove the attachment bolt. Slide the landing gear and fairing free of the wing structure.

INSTALLATION OF THE MAIN LANDING GEAR

a. Place the landing gear fairing over the main gear assembly and position the gear on the wing mounting structure. Install the landing gear mounting bolt.

b. Connect the hydraulic brake fluid line at the lower wing skin and bleed the lines.

NOTE

If the aircraft is equipped with dual brakes it will be necessary to use a pressure pot, bleeding from the wheel cylinders upward.

e. Install the landing gear fairing attaching screws.

REMOVAL OF THE NOSE LANDING GEAR

a. Support the fuselage by hoisting or cradle at the firewall.

b. Support the nose gear assembly.

c. Disconnect the nose steering linkage (if installed) from the cover plate.

d. Remove the screws attaching the cover plate to the top of the nose landing gear strut and swing the cover plate and shimmy dampener to the side.

e. Remove the safety wire from the centering cable assembly.

f. Turn the nose wheel to its extreme right travel and disconnect the slack end of the centering cable from the tension spring.

g. Remove the bolts through the centering collar and remove the cable assembly, spring and centering collar.

h. When the support under the nose gear is removed, the gear will fall free of the gear mounting structure.

INSTALLATION OF THE NOSE LANDING GEAR

a. Lift the nose gear into position, install the centering collar and the centering cable assembly. Do not tighten the mounting bolts.

b. Turn the nose gear left and hook the left centering cable over the centering spring. Turn the nose gear right and hook the other cable over the spring. Wire the cable clevis ends together with AN993N40 wire.

NOTE

Torque the mounting bolts to 40 to 50 inch-pounds. Use extreme care not to crush the centering cable or over torque the bolts. Be certain that the two AN960D616 washers are in place under the cable.

c. Install the cover plate and shimmy dampener with the attaching screws.

d. Connect the steering linkage (if installed) to cover plate.

NOTE

On aircraft serials M-1104 and after, MA-318 through MA-368 and MB-338 and after the nose gear steering travel limiting stop bolts should be torqued to 45 to 50 inch-pounds. On earlier models when replacement of the nose wheel centering cable is necessary, the replacement cable will be equipped with the larger AN6-15A bolt. This will necessitate reaming the holes in the nose wheel steering collar and landing gear housing to 3/8 inch and back spotfacing the inside of the landing gear casting to .95 inch in order to accommodate the AN960D616 washers in lieu of the AN960D516 washers.

CORROSION PREVENTATIVE MAINTENANCE OF MAGNESIUM

Maintenance procedures for either the nose or main shock strut are basically the same. Within the shock strut are rubber shock discs that act as a ride control. New rubber shock discs may be adjusted as outlined under SHOCK ABSORBER DISC EFFPLACEMENT in this section.

Magnesium shock strut castings are subject to corrosive effects of the elements. Whenever a hole is drilled or the surface is marred in any way the bare surfaces should be treated per military specification MIL-M-3171C as follows:

a. Place approximately 3/4 gallon of water in a stainless steel, aluminum, vinyl polyethylene, or a rubber lined container which will measure 1 gallon of fluid. The water should be at a temperature of between 70° and 90°F. First add 1-1/3 oz. of chromic acid (CrO_3) then 1 oz. of calcium sulphate ($CaSO_4$) to the water. Add water to make 1 gallon of solution and stir vigrously for at least 15 minutes.

b. Brush the solution in and around the bare surface of the magnesium, keeping the area wet with the brush-on solution for 1 to 3 minutes to produce a brown film. Do not exceed 3 minutes.

c. If practical rinse the part in cold (Do not use hot) running water and dry, either in an oven or exposure to hot air blast. In the event cold running water is not available, rinsing may be eliminated and the part dried as stated above.

d. Apply a liberal coating of zinc chromate primer.

TORQUE KNEE PINS AND BUSHINGS

If the steel oilite bushings, installed on serials M-1 through M-554, are working loose or the bushing holes are elongated in the nose or main landing gear housing an oversize bronze bushing is available for replacement. The oversize bronze bushing has an outside diameter of .690 to .691 inches as compared to .6865 to .6875 inch diameter of the steel oilite bushing. The hole oversize in the landing gear housing must not be greater than .6885 to .6895 inch diameter. If the bushing holes in the landing gear housing are smaller than these dimensions, ream the holes to the .6885 to .6895 inch diameter and press the bushing into the housing. A new torque knee pin with a grease fitting is required when the oversize bronze bushings are installed. Effective with serials M-555 and after the bronze bushing and the new torque knee pin with a grease fitting is installed at the factory.

WHEEL ALIGNING (Serials M-1 and after, MA-1 thru MA-368 and MB-1 and after only)
(Figure 3-23)

a. Position the strut into the wing strut adapter and lower the airplane on the strut. The airplane should be near gross weight during wheel alignment.

b. The wheels are aligned with a 1/16 to 1/8 inch toe-in by fabricating two straight angle or channel bars (see Figure 3-23) from material of sufficient strength to insure accurate measurements.

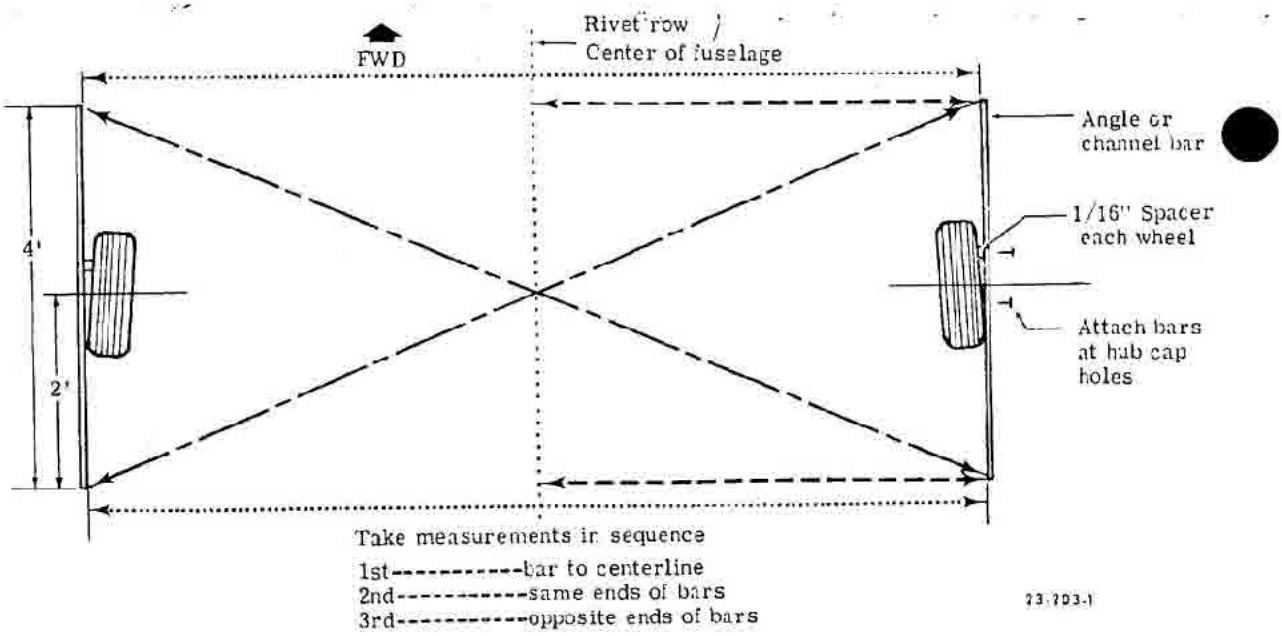


Figure 3-23. Main Wheel Alignment

c. To assure correct toe-in, position a 1/16 inch thick spacer between each bar and wheel casting at the forward hub cap hole and secure the bars horizontally at the forward and aft hub cap holes.

NOTE

Certain types of tires may extend beyond the wheel rim and interfere with the bars. Use additional but equal spacers at both front and rear hub cap holes as required to clear the tires.

d. The first wheel must be aligned from the centerline of the airplane by using the center row of rivets (see Figure 3-23) on the belly section as a reference line. Use a straight edge and mark a centerline from these rivets.

e. With the 1/16 inch spacer in place, measure equal distances from both ends of the bar to the center line, rotating the landing gear as necessary.

f. Install a new Jo-bolt by holding the head tightly against the housing with vise-grip type pliers and turning the Jo-bolt shaft clockwise with an open end wrench until the shaft shears.

NOTE

In the area of the newly drilled bolt holes the bare metal should be treated as described in CORROSION PREVENTATIVE MAINTENANCE OF MAGNESIUM.

NOTE

Weight of the airplane must be on the landing gear when the new hole is drilled.

g. Align the second wheel to the first wheel by measuring the distance between the same ends of the bars. When this distance is equal the bars will be parallel to the centerline and the wheel will be positioned to the correct toe-in.

h. A further check for correct alignment may be obtained by measuring diagonally between opposite ends of the bars (see Figure 3-23).

INSTALLING A NEW MAIN LANDING GEAR STRUT TO THE WING

a. Position the strut into the wing strut adapter. (See WHEEL ALIGNING)

b. Align the wheels.

c. Install a new Jo-bolt by holding the head tightly against the housing with vise-grip type pliers and turning the Jo-bolt shaft clockwise with an open end wrench until the shaft shears.

NOTE

When Jo-bolts are installed and a new assembly either strut or adapter are required, the new 3/8 inch holes to be drilled may be lowered 1 inch, on centers, from the original hole location. Be certain to maintain 2 diameter E.D. (edge distance).

NOTE

The landing gear must support the total weight of the airplane during the drilling operation.

NOTE

Airplane serials M-1393 and after, MB-536 and after, and prior airplanes that have complied with Service Instructions No. 0465-202, have Jo-bolts installed in the landing gear housing and weld assembly. If the landing gear must be removed for any reason the Jo-bolts may be removed by grinding off the heads and pressing the remaining portion into the inside of the housing. The Jo-bolts may be installed by holding the head of the bolt tightly against the housing with vise grip type pliers and turning the bolt shaft to the right (clockwise) with an open end wrench until the bolt shaft shears. In some instances it may be desirable to ream the existing holes to .3905 to .3935 and install NAS 1751-6L7 Jo-bolts. After installation of the Jo-bolts (either NAS669-6L7 or NAS1751-6L7) use a torque wrench and apply pressure in a counterclockwise (LH) direction up to 30 inch-pounds. Do not exceed 30 inch-pounds. If the Jo-bolt nut does not move, the installation is good; if the nut rotates, grind off the Jo-bolt and install a new one.

INSTALLING A NEW STRUT ADAPTER TO THE WING

a. Remove the plate from the wing access hole forward of the strut adapter.

b. Remove the row of screws in the top and bottom spar caps that attach the adapter to the spar (do not remove the two large cap screws forward of the screws in the spar).

c. Work through the wing access hole and remove the three 1/4 inch bolts securing the strut adapter to the spar web. Work the adapter out through the adapter hole.

d. Position the new strut adapter in place and secure to the spar web and to the upper and lower spar caps.

e. Refer to INSTALLING A NEW MAIN LANDING GEAR STRUT TO THE WING for installation of the strut to the strut adapter.

NOTE

When installing a new main landing gear strut, the landing gear must support the total weight of the airplane during the drilling operation.

SHOCK ABSORBER RUBBER DISC REPLACEMENT (FIXED GEAR AIRPLANES AND NOSE GEAR OR RETRACTABLE GEAR AIRPLANES)

Rubber discs should be replaced only as sets.

a. Hoist and cradle the wing or place the airplane on jacks.

b. Remove the landing gear from the airplane.

c. Remove the 1-7/16 inch retaining nut (P/N AN364-1614) from the top of the shock absorber rod that passes through the rubber disc stack assembly.

d. Remove the rubber disc stack assembly from the strut and remove the rubber discs from the shock absorber rod.

e. Install new rubber discs on the shock absorber rod and compress the stacked discs in a vise.

NOTE

Rubber shock absorber discs should be replaced in matched sets. Do not mix old discs with new discs.

NOTE

Precompression of the discs in a vise is critical in order to eliminate the need for a press to obtain the dimensions called out in step g.

f. Install the rubber disc assembly in the strut.

g. Position the rubber abrasion washer, the metal washer and the 1-7/16 inch nut on the shock absorber rod and adjust the nut to a point where the distance from the center of the pin to the bottom edge of the landing gear housing is 1.31 inches for the main gear and .75 inch for the nose gear. (See Figure 3-24)

h. Install the landing gear on the airplane.

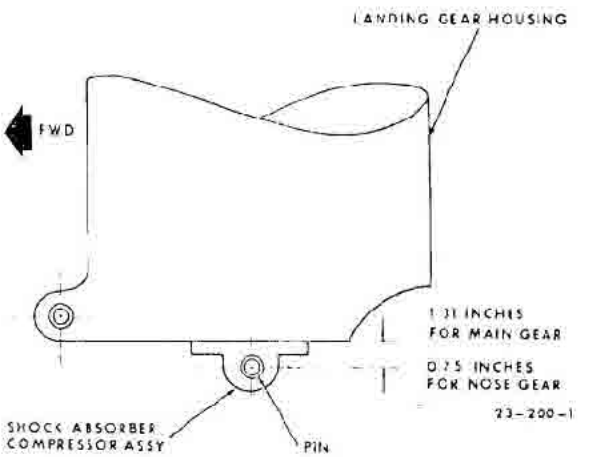


Figure 3-24. Measurement Gear Housing to Pin With New Biscuits Installed

NOTE

The rubber shock discs compress from the weight of the airplane and very shortly take a set. When, after time in service, the airplane is placed on jacks, the wheel assembly may be moved up and down quite freely for a distance of 2 inches or more. DO NOT ATTEMPT TO REMOVE THIS PLAY BY TIGHTENING THE 1-7/16 inch retaining nut at the top of the shock biscuit compression tube. Unless there is evident deterioration of the rubber discs, they need not be replaced as a result of the compression set.

HARD LANDING CHECK

RETAINING PIN INSPECTION

NOSE WHEEL: FIXED GEAR

After a hard landing, carefully inspect the pin retaining the nose wheel compression tube to the compression plate for possible deformation or separation.

a. With the nose wheel raised off the ground, use a felt tip pen or grease pencil to scribe a reference line on the side of the compression plate at the bottom edge of the nose wheel housing.

b. Remove the adapter plate from the top of the nose wheel housing and loosen the 1-7/16 inch nut on the top of the compression tube until the MS9048-180 retaining pin is accessible below the bottom of the nose wheel housing.

c. Insert a No. 40 drill bit through the MS9048-180 retaining pin. The pin is located directly above the nose wheel compression plate/gear fork knee pin.

NOTE

A straight piece of 10 gage wire or a piece of 3/32 welding rod may be used instead of a No. 40 drill bit.

NOTE

On some airplanes one end of the pin may be peened over, in which case the drill bit should be inserted from the other side. If the drill bit will not slide smoothly through the MS9048-180 retaining pin, it is an indication of deformation. If deformation is found the following steps should be accomplished.

d. Remove the landing gear as outlined in REMOVAL OF THE NOSE LANDING GEAR for Fixed Landing Gear.

e. Remove the nose gear shock biscuit assembly from the nose wheel housing and disassemble so that a thorough inspection of the compression tube and compression plate may be accomplished.

f. After the inspection of the MS9048-180 retaining pin and repair or replacement (if needed) has been accomplished, reassemble the shock biscuit assembly and reinstall in the nose wheel housing; then tighten the 1-7/16 inch nut until the reference line scribed on the compression plate again aligns with the bottom of the nose wheel housing.

g. Reinstall the landing gear as outlined in INSTALLATION OF THE NOSE LANDING GEAR for Fixed Landing Gear.

RETAINING PIN INSPECTION

MAIN GEAR WHEEL: FIXED GEAR

The MS9048-180 retaining pin is accessible on the main landing gear of most airplanes, however, on airplanes which have been in service long enough for the shock biscuits to acquire a compression "set" it may be necessary to raise the plane from the ground sufficiently to allow the compression plate to extend below the landing gear housing in order to have access to the MS9048-180 retaining pin.

a. Insert a No. 40 drill bit through the MS9048-180 retaining pin. The pin is located directly above the compression plate/gear fork knee pin.

NOTE

A straight piece of 10 gage wire or a piece of 3/32 welding rod may be used instead of a No. 40 drill bit.

NOTE

On some airplanes one end of the pin may be peened over, in which case the drill bit should be inserted from the other side. If the drill bit will not slide smoothly through the MS9048-180 retaining pin, it is an indication of deformation. If deformation is found the following steps should be accomplished.

b. Jack the airplane off the ground.

c. Remove the landing gear as outlined in REMOVAL OF THE MAIN LANDING GEAR for Fixed Landing Gear.

d. Scribe a line with a felt tip pen or grease pencil on the compression plate at the bottom of the main gear wheel housing.

e. Remove the main gear shock biscuit assembly from the main gear wheel housing and disassemble so that a thorough inspection of the compression tube and compression plate may be accomplished.

f. After the inspection of the MS9048-180 retaining pin and repair or replacement (if needed) has been accomplished, reassemble the shock biscuit assembly and reinstall in the main gear wheel housing; then tighten the 1-7/16 inch nut until the reference line scribed on the compression plate again aligns with the bottom of the main gear wheel housing.

g. Reinstall the landing gear as outlined in INSTALLATION OF THE MAIN LANDING GEAR for Fixed Landing Gear.

SKIN AND STRUCTURE DEFORMITY CHECK

After a hard landing, carefully inspect the wing and landing gear in the area of the landing gear fitting. Landing loads in excess of that for which the airplane is designed are usually indicated by diagonal wrinkles in the fuel cell leading edge and in the lower wing skin aft of the fuel cell.

NOTE

In the event diagonal wrinkles are evident in the fuel cell area, contact Beech Aircraft Corporation, Sales and Service, P O. Box 300, Liberal, Kansas 67901 with a full description and high quality photographs of the wrinkled areas.

a. Remove the main landing gear assembly as outlined under REMOVAL OF THE MAIN LANDING GEAR in this section.

b. Inspect the upper and lower attach flanges of the landing gear support fitting and the flange that attaches to the spar web with a light and mirror. Also inspect the spar web.

c. Remove the outboard NAS bolt in the top of the wing over the landing gear support fitting and inspect the bolt and hole for distortion. If no distortion is noted, reinstall the bolt. If distortion is apparent a standard inspection hole must be cut in the bottom wing skin to gain access to the nut on the large NAS bolt. Center the inspection opening 4 inches inboard from the gear support fitting. Working through this opening, remove the nut and bolt.

d. Distorted bolt holes found in step c. may be drilled oversize (.375 maximum) to clean out; and a stainless steel bushing may be installed. The bushing I.D. should be a close tolerance fit for the bolt called out, and the O.D. should be a close tolerance fit in the hole.

e. Repair or replace distorted skin areas as required.

f. Inspect the landing gear housing in the area of support holes for cracks by dye check or other suitable method.

g. Reinstall the removed components and repaint as necessary.

NOSE STRUT BEARING REPLACEMENT
(Figure 3-25)

a. Before disassembly of the strut, check the up and down end play of the nose strut bearing. End play should be sufficient to allow free movement of the strut. Reduce end play in the nose strut by adding P/N 50-820024 laminated shim stock or equivalent between the upper bearing and the centering collar before the bearing is

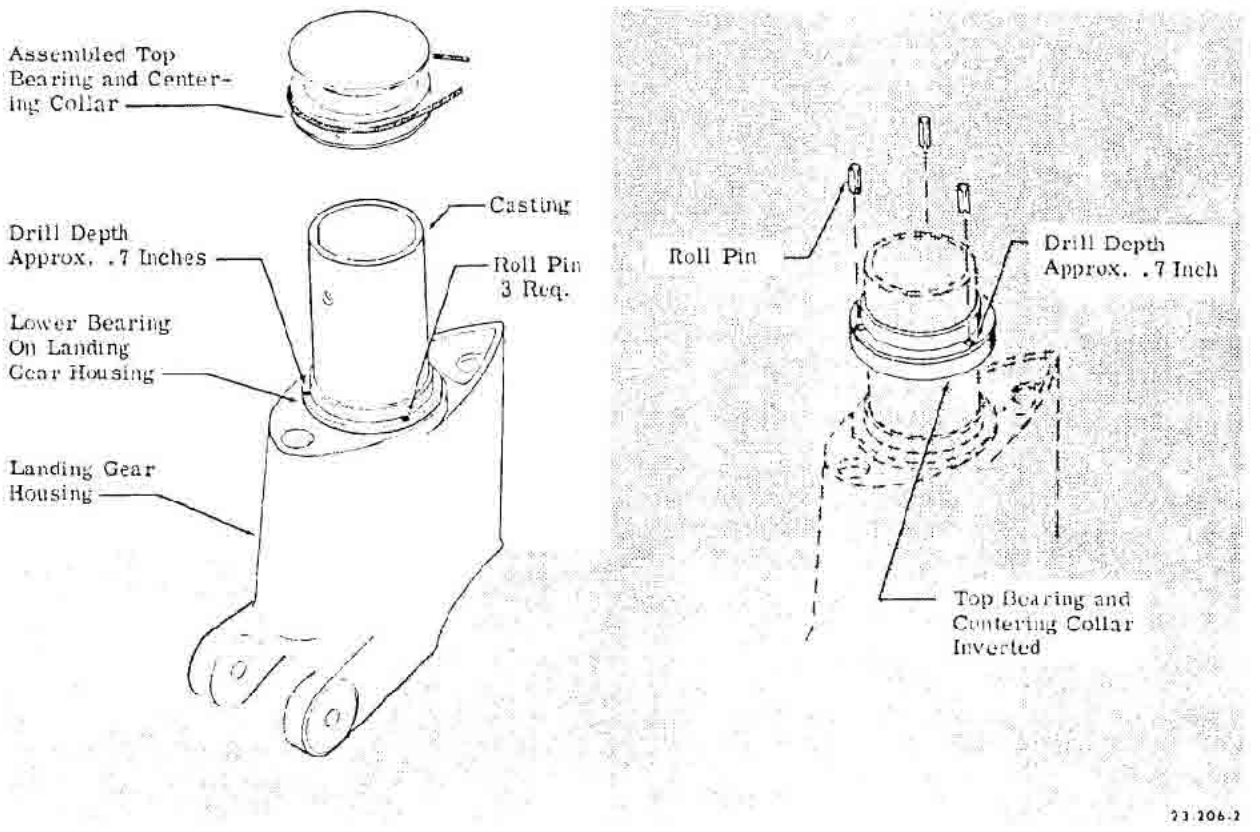


Figure 3-25. Nose Strut Bearing Replacement

assembled to the collar. (Usually .020 to .040 inch shim thickness is required).

b. Remove the nose gear (see REMOVAL OF THE NOSE GEAR).

c. Remove the existing roll pins from the bearings.

d. Drill three No. 30 (.133/.128) inch diameter holes in each bearing .15 inch in from the bearing flange and spaced approximately 60° from the existing roll pins. Drill depth of the holes should be approximately .7 inch into the housing so that the roll pins (see Figure 3-25) will position approximately 1/32 inch below the bearing surface.

NOTE

Invert the centering collar and upper bearing and position over the casting (see Figure 3-25). Drill the three 1/8 inch holes and install shims, if required, and the roll pins. Remove the assembly from the casting.

e. Pack the bearings with Aero Lubriplate grease (product of BRC Bearing Company, Wichita, Kansas), reassemble the nose gear strut and install the nose gear to the aircraft.

f. Check end play of the strut as indicated in step a.

RETRACTABLE LANDING GEAR

(MC-2 and after)

The retractable tricycle landing gear, fabricated from magnesium casting and aluminum forgings, uses rubber discs for shock absorption. The nose gear is steerable through a spring loaded linkage connected to the rudder pedals, and has a maximum travel of 40° right and 27° left. A hydraulic dampener on the nose wheel strut compensates for any tendency to shimmy. Toe brakes will aid in steering the airplane.

The landing gears are controlled by a two-position switch just to the left side of the engine controls. The switch handle must be pulled out of the safety detent before it can be moved to the opposite position.

The landing gear position indicator lights are located below the landing gear switch handle. Three green lights, one for each gear, are illuminated whenever the landing gears are down. The red light illuminates any time one or all of the landing gears are in transit or in any intermediate position. All of the lights will be out when the gears are up and locked. Pressing the warning light test button on the instrument panel will verify the landing gear lamp bulbs are illuminating. The intensity of the lamps can be controlled by turning the lens holder on each lamp.

A landing gear safety switch, located in the pitot system, will open the landing gear circuit to prevent inadvertent retraction of the gear at speeds less than 68 to 72 mph.

CAUTION

Never rely on the safety switch to keep the gear down during taxi or on take-off or landing roll. Always make certain that the landing gear position switch is in the down position during these operations.

With the landing gear retracted, if the throttle is retarded below approximately 12 in Hg manifold pressure, a warning horn will sound continuously.

The landing gear motor circuit breaker is located on the right subpanel. This circuit breaker is a pull and reset type breaker. The breaker will pop-out under overload conditions. The remainder of the landing gear circuitry is protected by a push to reset circuit breaker marked LDG GEAR.

An electric motor, hydraulic pump unit, manifold and shuttle valve are located at FS 181.00. The two main gear cylinders are located at WS 100.00 aft of the main spar, and the nose gear cylinder is located beneath the cabin floor at BL 13.00 and aft or 68.00. The main gear retracts outboard of the fuel tanks at WS 76.00. The nose gear retracts aft and rotates 90° clockwise for storage.

In the retract mode the electric motor, when viewed from the top, rotates the pump clockwise forcing hydraulic fluid through the manifold to the retract side of the system. A pressure switch, located on the manifold automatically shuts off the motor when system pressure reaches 1550 ± 100 psi. If the pressure drops to 1250 ± 100 psi during the retract mode the pressure switch will turn the motor on until pressure again reaches 1550 ± 100 psi. An uplock check valve, in the pump, retains this pressure to hold the nose gear in the retracted position. A hydraulic cylinder actuated uplock is also utilized on each main gear to assist system pressure in the retracted position.

In the extend mode the motor, when viewed from the top, rotates counterclockwise forcing hydraulic fluid through the manifold and shuttle valve to the extend side of the system.

Main gear downlock is accomplished by overcenter travel of a spring-held side brace. Nose gear downlock is accomplished by overcenter travel of the drag link, a spring and a hydraulic cylinder actuated downlock. After the gears are down and locked, system pressure will bleed back to the reservoir resulting in zero pressure. Downlimit switches located on each gear will actuate the landing gear pump and motor assembly should one gear inadvertantly start to retract with the landing gear position switch in the DOWN position.

Emergency extension of the gear is accomplished by turning the handle on the dump valve located on the floor

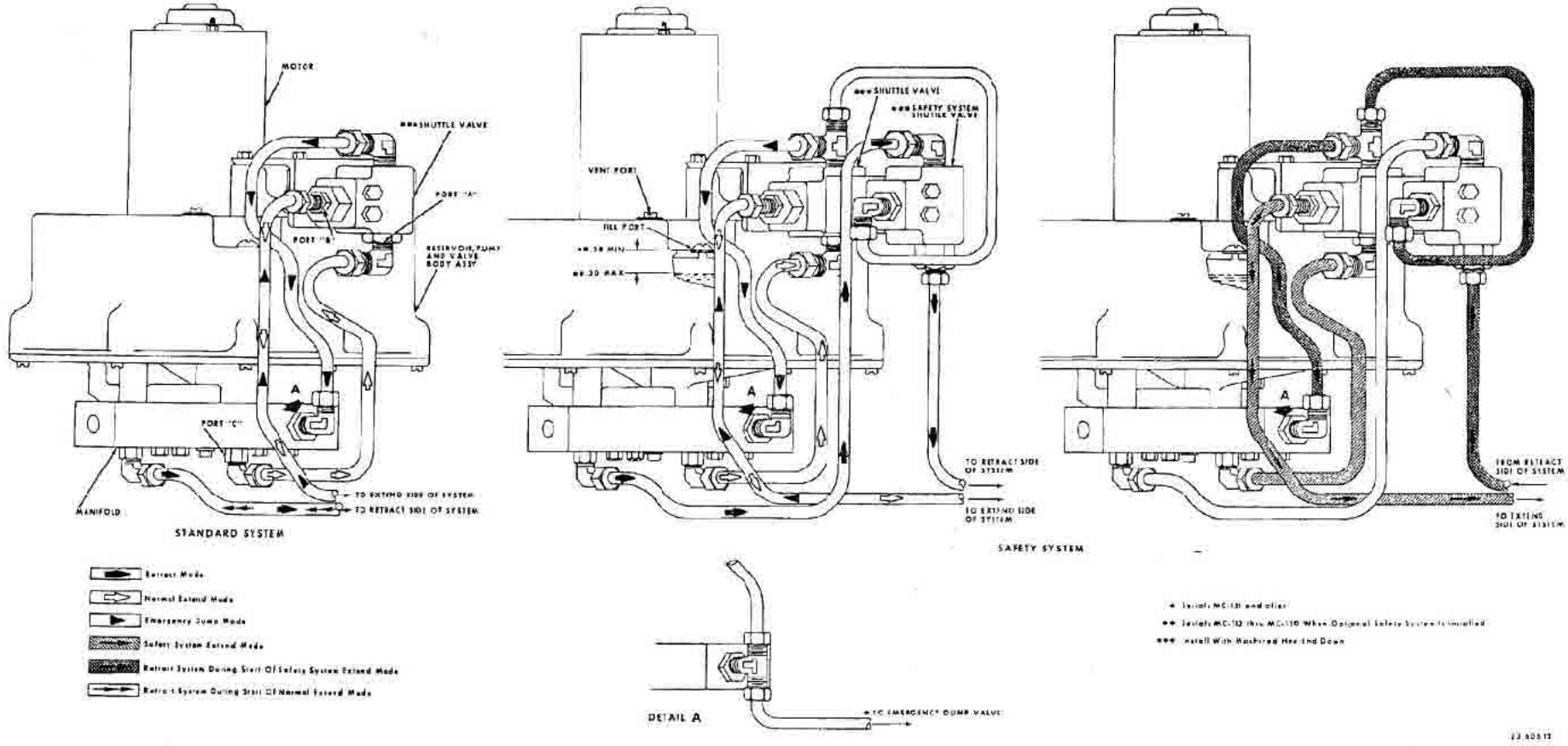


Figure 3-25A. Landing Gear Hydraulic Fluid Flow Schematic

in front of the pilot's seat 90° counterclockwise, allowing hydraulic fluid from the retract side of flow into the extend side of the system through the shuttle valve (MC-2 thru MC-150) and into the reservoir. On serials MC-151 and after, the shuttle valve is by-passed permitting the hydraulic fluid to drain directly into the manifold. The dump valve releases pressure from the retract side of the system and allows the gear to free fall into the down and locked position.

LANDING GEAR SAFETY SYSTEM (OPTIONAL)

The optional landing gear safety system consists of a spring loaded, two-position landing gear switch, a throttle position switch, a pressure switch located in the pitot system, a landing gear safety system ON-OFF switch located on the instrument panel and an additional shuttle valve. The safety system is protected by a 5-ampere circuit breaker.

The landing gear safety system is designed to prevent "gear up" landings. The system is to be used as a safety back up device only; normal usage of the landing gear position switch is mandatory.

To extend the landing gear, place the landing gear safety system ON-OFF switch in the ON position and the landing gear will be automatically extended when: (1) the airspeed is below approximately 115 MPH IAS and (2) the engine is operating at a throttle position corresponding to approximately 18 inches or less of manifold pressure.

To retract the landing gear place the landing gear safety system ON-OFF switch in the ON position, the landing gear will not retract unless: (1) the landing gear position switch is in the UP position, (2) the airspeed is above approximately 72 MPH IAS and (3) the engine is operating at a throttle position corresponding to approximately 20 inches or more of manifold pressure.

If landing gear retraction is desired when the throttle position corresponds to 20 inches of manifold pressure or less, the landing gear safety system ON-OFF switch must be placed in the OFF position before placing the landing gear position switch in the UP position.

In the event of an emergency, automatic extension of the landing gear may be prevented by placing the landing gear safety system ON-OFF switch in the OFF position, thus deactivating the safety system.

REMOVAL AND INSTALLATION OF MAIN GEAR

a. Place the aircraft on jacks, using the jack pads, and a support under the tail.

b. Support the gear to prevent it from falling when it is disconnected from the aircraft.

c. Disconnect and immediately cap the brake lines at the top of the strut fork. Care at installation, to see that no air is trapped at the fitting may eliminate the need for rebleeding the brake system.

d. Remove the access plates aft of the gear well and disconnect the outboard end of the actuator piston from the drag link arm.

e. Remove the bolt at the inboard end of the drag link (side brace) and raise the gear to relieve spring tension and release the spring.

f. Remove the taper pins in the torque shaft on each side of the spar through the fork and actuator arm.

g. Remove the bolt in the forward top end of the fork and slide the aft torque shaft forward to release the landing gear from the wing.

NOTE

The landing gear circuit breaker should be pulled and the emergency gear extension valve should be open to relieve pressures in the hydraulic system when work is to be accomplished on the landing gear system. With the emergency gear extension valve closed, movement of a hydraulic cylinder during maintenance may cause actuation of the nose gear downlock cylinder or other components.

h. Installation of the gear may be accomplished in the reverse order of the removal procedure, however observe the rigging instructions for the hydraulic cylinder in Figure 3-26 before operating the landing gear, then a full retraction, extension and emergency extension check should be accomplished.

NOTE

During disassembly of the landing gear system please take note of the thrust washers identified as DV or DVO. These washers have a special coating on one or both sides which serves as a lubricant. Make sure the coated thrust washers are installed correctly to reduce friction and wear.

NOTE

When installing a new strut assembly it is not practical in the field to attempt to drill new taper pin holes in the strut, utilizing the old torque shaft. When a new strut housing is required, order the assembly i.e. housing, torque shaft and arm.

REMOVAL AND REPLACEMENT OF MAIN GEAR SIDE BRACE

Should it be necessary to replace the main gear side brace, side brace pin that goes through the spar, or the arm on the pin aft of the spar, it is necessary to replace all three components as an assembly unless an extremely competent machine shop is available, and then only if positive relationship of the arm and side brace can be determined.

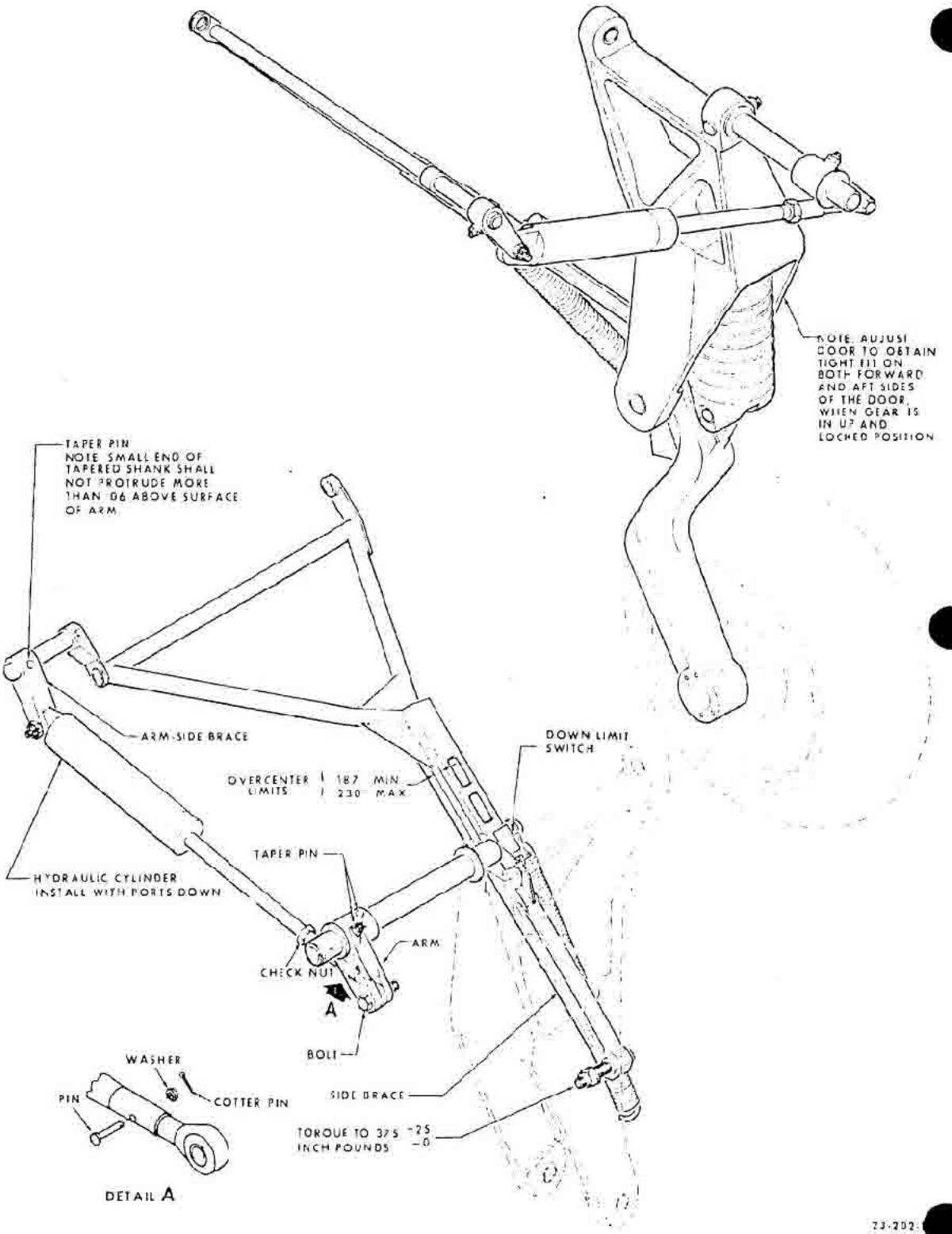


Figure 3-26. Main Landing Gear

NOTE

After installation of the new side brace assembly, a scale reading of 20-32 pounds must be obtained when pressure is applied at the side brace knee with the gear in the down and locked position. This is assurance that the over center limit is within tolerance.

REMOVAL AND INSTALLATION OF NOSE GEAR (RETRACTABLE)

a. Disconnect the drag link downlock spring at the lower end and remove the bolt connecting the drag link to the nose gear strut.

b. Disconnect the nose gear steering linkage from the adapter at the top of the nose gear. Note the thrust washer positions so they may be reinstalled in the same manner (slick sides against the adapter).

c. Remove the two pivot bolts attaching the nose gear yoke to the engine mount assembly. Note the thrust washer position so they may be reinstalled in the same manner (slick side of the washer against the yoke).

d. Installation of the nose gear may be accomplished in the reverse order of the removal procedure. Clevis bolt nut torque for the steering linkage is 1/4 turn after the nut contacts the spring washer.

NOTE

Before removal of the nose gear, check the vertical play of the nose gear in the yoke assembly. If more than .015 inch end play is evident, the area should be shimmed with laminated shim, P/N 50-820024 to reduce vertical play to .005 inch. See NOSE STRUT BEARING REPLACEMENT.

REMOVAL AND REPLACEMENT OF NOSE GEAR DRAG BRACE

Should it be necessary to replace the nose gear drag brace, torque shaft or arm, it is necessary to replace all three components as a drilled assembly, unless an extremely competent machine shop is available; and then only if positive relationship of the drag link and arm can be determined.

SHOCK ABSORBER DISC REPLACEMENT (RETRACTABLE MAIN GEAR)

NOTE

A tool (P/N 169-810031 code 917) is available for removing taper pins and for installing shock absorber biscuits on the main landing gear of the 24R series airplanes.

NOTE

The rubber shock discs compress from the weight of the airplane and will very soon take a set. After time in service a space of up to 1/2 inch may become apparent between the bottom of the 1-7/16 inch retaining nut and the magnesium casting due to the compression set, possibly creating the impression the retaining nut has backed off. DO NOT ATTEMPT TO TIGHTEN THE RETAINING NUT AT THE TOP OF THE SHOCK BISCUIT COMPRESSION TUBE. TO DO SO WILL CHANGE THE CASTER OF THE GEAR DURING RETRACTION AND MAY RESULT IN THE TIRE BINDING ON THE AFT EDGE OF THE WHEEL WELL, PREVENTING EXTENSION. ANY TIME ADJUSTMENT IS MADE TO THE 1-7/16 INCH RETAINING NUT, THE AIRPLANE MUST BE PLACED ON JACKS AND A RETRACTION CHECK ACCOMPLISHED TO ASSURE 1/2 INCH CLEARANCE BETWEEN THE TIRE AND THE FORWARD EDGE OF THE WHEEL WELL CUT OUT.

a. Remove the 1-7/16 inch nut from the top of the shock absorber compression rod before placing the airplane on jacks.

b Jack the airplane off the ground and remove the lower drag brace bolt in order to disconnect the downlock spring.

c. Remove the landing gear door.

d. Remove the clevis pin and dowel pin securing the fork to the housing and lower the fork sufficiently to remove the shock absorber discs from the compression rod.

e. Clean the compression rod with methyl-ethyl-ketone or a suitable solvent, allow to dry, and install the new set of 8 rubber discs.

NOTE

Rubber shock absorber discs being replaced for normal rubber deterioration purposes should be replaced in sets. Do not mix old discs with new discs.

f. Installation is the reverse of the removal procedure. After assembly, install the washer and the 1-7/16 inch nut and draw the nut down to compress the biscuit to approximately 6.5 inches (top of upper biscuit to bottom of lower biscuit, measured at aft side of biscuit stack).

g. Place the airplane on jacks and perform a retraction check. The tire should clear the forward edge of the wheel well cutout by 1/2 inch. Should the measurement be less, the 1-7/16 inch nut may be tightened to obtain the necessary clearance.

HARD LANDING CHECK

RETAINING PIN INSPECTION

NOSE WHEEL: RETRACTABLE GEAR

After a hard landing, carefully inspect the pin retaining the nose wheel compression tube to the compression plate for possible deformation or separation.

a. With the nose wheel raised off the ground, use a felt tip pen or grease pencil to scribe a reference line on the side of the compression plate at the bottom edge of the nose wheel housing.

b. Remove the adapter plate from the top of the nose wheel housing and loosen the 1-7/16 inch nut on the top of the compression tube until the MS9048-180 retaining pin is accessible below the bottom of the nose wheel housing.

c. Insert a No. 40 drill bit through the MS9048-180 retaining pin. The pin is located directly above the nose wheel compression plate/gear fork knee pin.

NOTE

A straight piece of 10 gage wire or a piece of 3/32 welding rod may be used instead of a No. 40 drill bit.

NOTE

On some airplanes one end of the pin may be peened over, in which case the drill bit should be inserted from the other side. If the drill bit will not slide smoothly through the MS9048-180 retaining pin, it is an indication of deformation. If deformation is found the following steps should be accomplished.

d. Remove the landing gear as outlined in REMOVAL AND INSTALLATION OF NOSE GEAR (RETRACTABLE).

e. Remove the nose gear shock biscuit assembly from the nose wheel housing and disassemble so that a thorough inspection of the compression tube and compression plate may be accomplished.

f. After the inspection of the MS9048-180 retaining pin and repair or replacement (if needed) has been accomplished, reassemble the shock biscuit assembly and reinstall in the nose wheel housing; then tighten the 1-7/16 inch nut until the reference line scribed on the compression place again aligns with the bottom of the nose wheel housing.

g. Reinstall the landing gear as outlined in REMOVAL AND INSTALLATION OF NOSE GEAR (RETRACTABLE).

RETAINING PIN INSPECTION

MAIN GEAR WHEEL: RETRACTABLE

The MS9048-180 retaining pin is accessible without raising the airplane on the retractable gear A24R, B24R, and C24R

a. Insert a No. 40 drill bit through the MS9048-180 retaining pin. The pin is located directly above the compression plate/gear fork knee pin.

NOTE

A 6 inch or longer drill bit should be used to check the MS9048-180 retaining pin on the retractable landing gear wheel. A straight piece of 10 gage wire or a 3/32 welding rod may be used instead of a No. 40 drill bit.

NOTE

On some airplanes one end of the pin may be peened over, in which case the drill bit should be inserted from the other side. If the drill bit will not slide smoothly through the MS9048-180 retaining pin, it is an indication of deformation. If deformation is found the following steps should be accomplished.

b. Jack the airplane off the ground.

c. Remove the landing gear as outlined in REMOVAL AND INSTALLATION OF MAIN GEAR (RETRACTABLE).

d. Measure from the top of the shock assembly compression tube to the top of the 1-7/16 inch nut, note the dimension, and loosen the nut.

e. Remove the main gear shock assembly from the main gear wheel housing and disassemble so that a thorough inspection of the compression tube and compression plate may be accomplished.

f. After the inspection of the MS9048-180 retaining pin and repair or replacement (if needed) has been accomplished, reassemble the shock biscuit assembly and reinstall in the main gear wheel housing; then tighten the 1-7/16 inch nut until the distance from the top of the nut to the top of the compression tube is the same as the measurement taken before disassembly.

g. Reinstall the landing gear as outlined in REMOVAL AND INSTALLATION OF MAIN GEAR (RETRACTABLE).

h. While the airplane is still on jacks, perform a retraction check to assure that there is 1/2 inch clearance between the tire and the forward edge of the wheel well cutout.

NOTE

A retraction check MUST be performed any time the 1-7/16 inch nut is adjusted.

RIGGING THE LANDING GEAR

(Figures 3-26 and 3-27)

a. Make sure the BATTERY and ALT switch is in the OFF position and the landing gear circuit breaker is pulled.

b. Place the airplane on jacks, fully extend the gear and remove the necessary access panels.

c. Remove the outboard attaching bolts from the hydraulic cylinder (opposite the rod end attaching bolt).

d. Extend the cylinder until the piston bottoms out and screw the hydraulic cylinder actuator rod into or out of

the adapter as required so that, with the piston bottomed out, the outboard cylinder attach bolt can be freely inserted into position. Install the bolt and nut and safety with the cotter pin.

e. Turn the actuating rod counterclockwise (outward) in the rod end adapter two complete turns and secure the locknut into position.

NOTE

Flats on the actuator rod will require a wrench to perform the adjustment.

f. Rig the opposite main landing gear in the same manner.

g. Remove the bolt securing the nose gear actuator to the torque shaft arm on the forward side of the firewall. Adjust the rod end so the centerline of the rod end hole is .12 - .19 inch aft of the centerline of the hole in the torque shaft arm. Tighten the lock nut and install the bolt.

NOTE

Since the nose gear actuator (hydraulic cylinder) is spring loaded to the gear down position it will be necessary to use a block of wood or a suitable substitute, nested against the F.S. 94.00 bulkhead to use as a leverage point in order to move the rod end out to a position where the torque shaft arm bolt can be removed or installed.

h. With the gear in the extended position, apply a load perpendicular to the articulating joint of the main gear side brace. The side brace should break from the fully locked position at a pressure of 20 - 32 pounds. See Figure 3-26 for the over center position of the side brace when the main gear is extended.

i. The nose gear drag link shall break over center as shown in Figure 3-27.

NOTE

The nose gear and main gear drag link/side braces should be installed in matched sets.

j. With the gear in the down position, adjust the nose gear downlock hook to fully engage the catch on the torque shaft arm. There should be .030 inch clearance between the flat of the hook and catch.

k. Disengage the nose gear downlock hook, break the drag link over center and move the nose gear slowly toward the retracted position while checking to see that the strut clears adjacent components. Adjust the steering linkage as required to obtain clearances.

l. Set the nose gear up-stop to maintain clearance of the fork and firewall on serials MC-77 and after. Prior to serial MC-77 the nose gear fork strikes a fixed rubber bumper cemented to the firewall flange.

m. Set the landing gear safety switch (pitot pressure switch) to actuate at 68 - 72 mph indicated airspeed as described in this section.

n. Turn the landing gear emergency extension valve to the CLOSED position and fill the pump reservoir with clean hydraulic fluid (Item 7, Consumable Materials Chart). On serials MC-113 thru MC-150 that have the optional landing gear safety system installed the pump reservoir should be filled to within .38 to .50 inches of the fill port.

o. Connect an external power source, turn the BATTERY and ALT switch on and push in the landing gear circuit braker.

p. The down limit switches located on the side brace of the main gear and drag link of the nose gear should be adjusted to actuate just as the brace/drag link breaks over center to the locked position.

q. The gear should be cycled through to make certain all adjustments have been properly made.

r. With the gear in the up position check to see that the uplock hook is engaged and that there is a minimum of .060 inch between the flat of the hook and the gear fork. Adjust the up-stop as required.

s. With the gear in the down position and electrical power shut off, raise the main gear and check for a minimum of .080 inch clearance between the uplock hook and the fork. In the extended position the uplock hook should clear the support bracket .03 inch. See Figure 3-28.

NOTE

Should it be necessary to replace the main gear upper side brace, most maintenance shops will not be able to drill the taper pin holes accurately. It is recommended the assembly, including the side brace, pin and torque arm be ordered and installed.

t. Replace all access panels and remove the airplane from the jacks.

CORROSION PREVENTATIVE MAINTENANCE OF MAGNESIUM

Maintenance procedures for either the nose or main shock strut are basically the same. Within the shock strut are rubber shock discs that act as a ride control. New rubber shock discs may be adusted as outlined under SHOCK ABSORBER RUBBER DISC REPLACEMENT in this section.

Magnesium shock strut castings are subject to corrosive effects of the elements. Whenever a hole is drilled or the surface is marred in any way the bare surfaces should be treated per military specifications MIL-M-3171C as follows:

a. Place approximately 3/4 gallon of water in a stainless steel, aluminum, vinyl polyethylene, or a rubber lined container which will measure 1 gallon of fluid. The water should be at a temperature of between 70° and 90° F. First

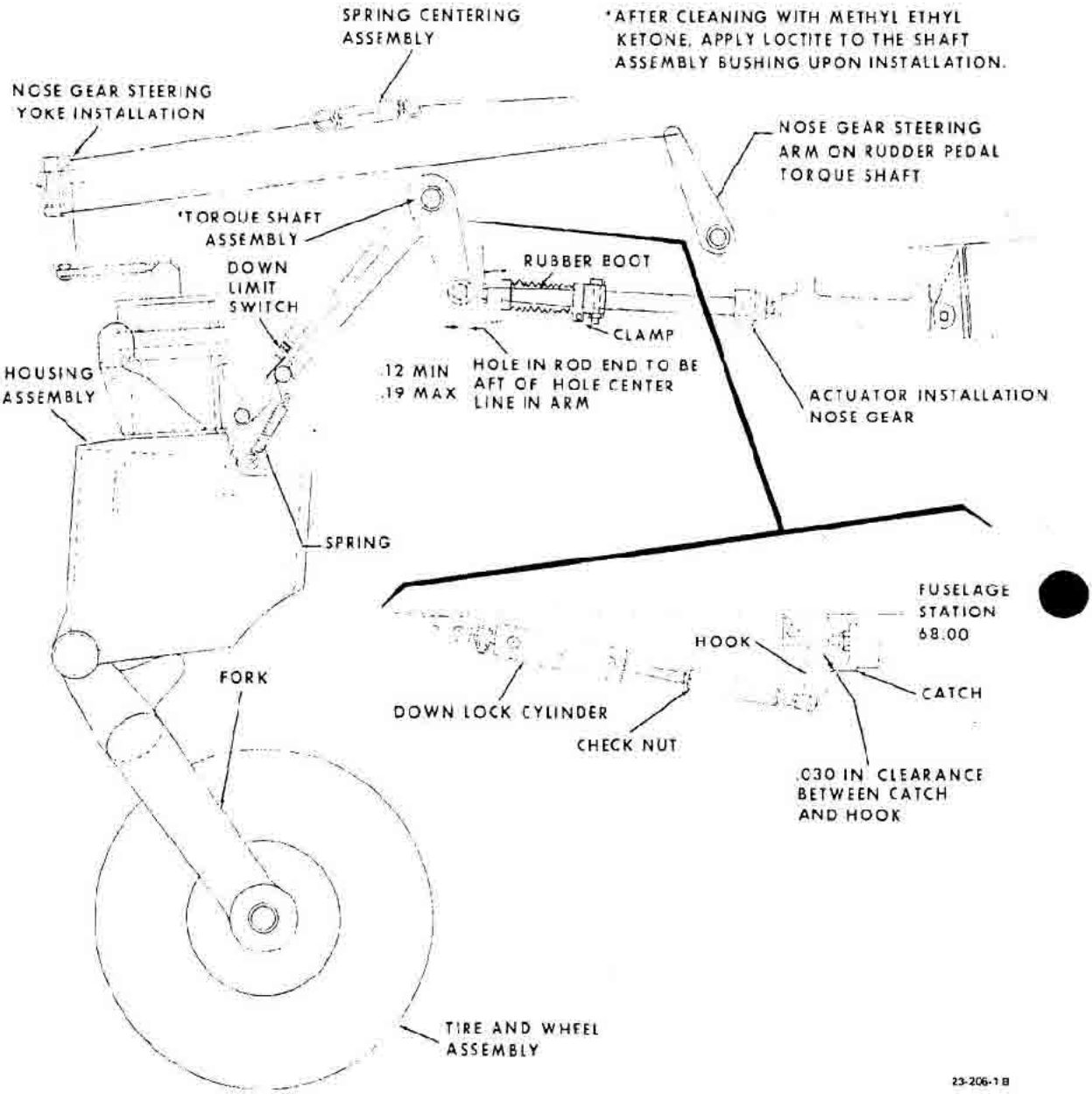


Figure 3-27. Nose Gear

add 1-1/3 oz. of chromic acid (CrO_3) then 1 oz. of calcium sulphate ($CaSO_4$) to the water. Add water to make 1 gallon of solution and stir vigorously for at least 15 minutes.

b. Brush the solution in and around the bare surface of the magnesium, keeping the area wet with the brush-on solution for 1 to 5 minutes to produce a brown film. Do not exceed 5 minutes.

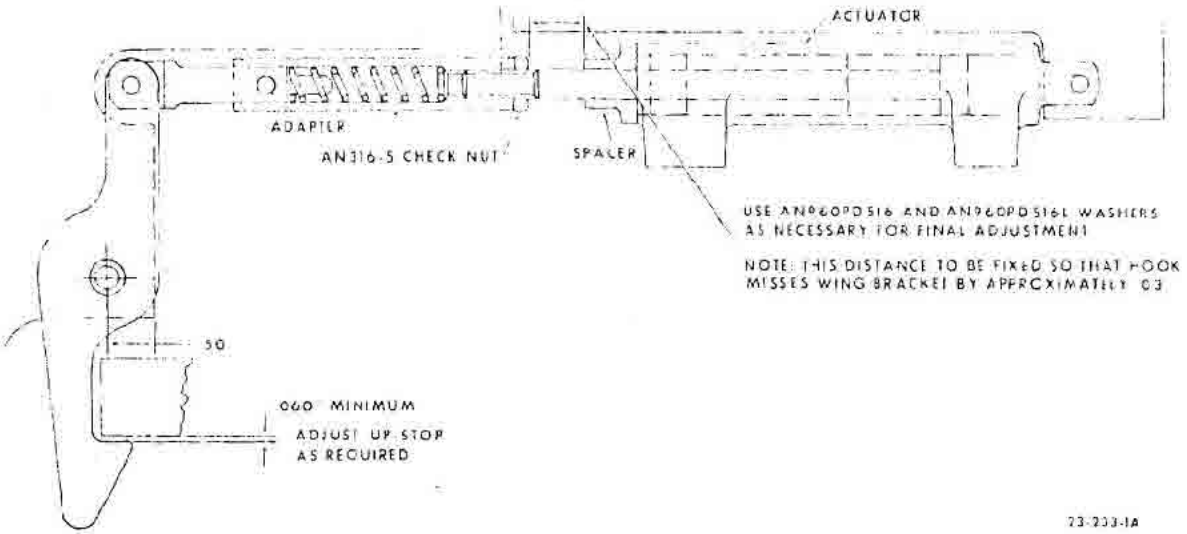


Figure 3-28. Main Gear Uplock

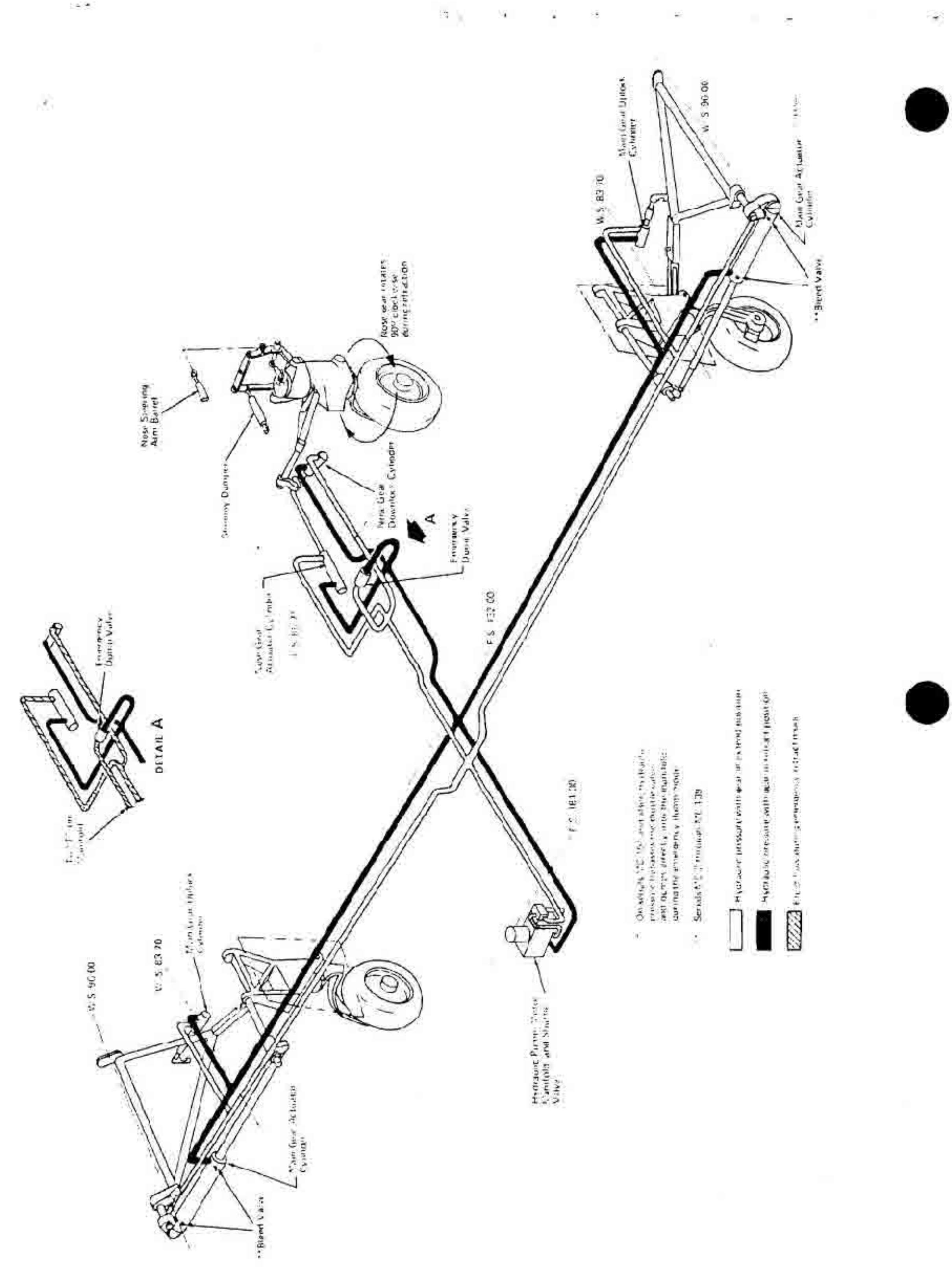


Figure 3-29. Landing Gear System

c. If practical rinse the part in cold (do not use hot) running water and dry, either in air oven or exposure to hot air blast. In the event cold running water is not available, rinsing may be eliminated and the part dried as stated above.

d. Apply a liberal coating of zinc chromate primer.

LANDING GEAR HYDRAULIC SYSTEM

RETRACT SYSTEM LEAK TEST

a. Place the airplane on jacks and pressurize the pitot system by placing a tube over the pitot mast head. Roll the tube up until the airspeed indicator shows a minimum of 72 mph indicated airspeed.

b. With the battery switch ON, cycle the landing gear to the retracted position, then pull the landing gear motor circuit breaker. The in-transit red light should not glow for a period of 30 minutes. Should the in-transit red light come on, a thorough check of the system for leaks should be accomplished as follows:

1. Remove all inspection plates so actuators and plumbing may be checked for leak indications.

2. Release the pressure on the system by lowering the landing gear. Loosen any connections found to be leaking and retorque to 40 - 65 inch lbs.

3. Retract the landing gear and again check for leaks.

NOTE

Any lines reflared should have nicks and burrs removed. All new or reworked lines should be cleaned with trichlorethylene or methyl-ethyl-ketone before installation.

4. In the event the in-transit red light continues to come on, yet there are no visible leaks in the system, lower the landing gear to release pressure in the retract lines.

5. Starting at the pump assembly aft of FS 181.00, block off the retract line and place the gear switch in the UP position to check for internal pump leaks.

6. The remaining portions of the retract system may be checked for internal leaks by blocking off a section at a time, i.e. left main actuator, then left main gear uplock cylinder, etc. until the inoperative component is found.

EXTENSION SYSTEM LEAK TEST

(Figure 3-25A)

a. With the gear in the extended position, disconnect the extend hose from either the right or left main landing gear actuator and with a "T" fitting and an additional high pressure hose, insert a 0-1500 psi gage at the "T" fitting and connect the additional hose to the "T" fitting and the actuator.

b. Disconnect the hydraulic line from port "A" and port "B" OF THE STANDARD SHUTTLE VALVE (see Figure 3-25A). Install a high pressure flex hose between the two disconnected lines to bypass the standard shuttle valve.

c. Disconnect the line from port "C" of the manifold and plumb it to a hand pump capable of delivering pressure to 1200 psi.

d. To build pressure in the extend system, apply enough pressure to the drag leg of one of the main landing gear to actuate the down limit switch until pressure builds on the gage to 900-1200 psi.

e. Monitor the gage for 30 minutes for a pressure drop. If a pressure drop is noted, inspect the extend plumbing, actuators and nose gear downlock for external leaks.

f. On serials MC-2 through MC-150, extend system pressure may be released by turning the emergency extend valve, located below pilot's floorboard, to the OPEN position. On serials MC-151 and after, extend system pressure must be released through the hand pump. Loosen any connections found to be leaking and retorque to 40-65 inch lbs.

NOTE

Lines that require reflaring should have nicks and burrs removed. All new or reworked lines should be cleaned with trichlorethylene or methyl-ethyl-ketone before installation.

g. Should the pressure drop continue, yet there is no indication of an external leak, the extend system may be blocked off by sections as described in the LEAK TEST RETRACT SYSTEM until the inoperative part is found.

NOTE

It will be necessary to relocate the gage in order to leak test the various sections of the system for internal leaks.

VALVE BODY DISASSEMBLY

a. Lay the valve body on a flat surface and remove the seven retaining screws as shown in Figure 3-29B. Do not loosen or remove the three valve adjustment set screws or lock nuts.

b. Separate the upper valve body from the lower valve body and note the position and size of the check balls and the location and size of the springs shown in Figure 3-30.

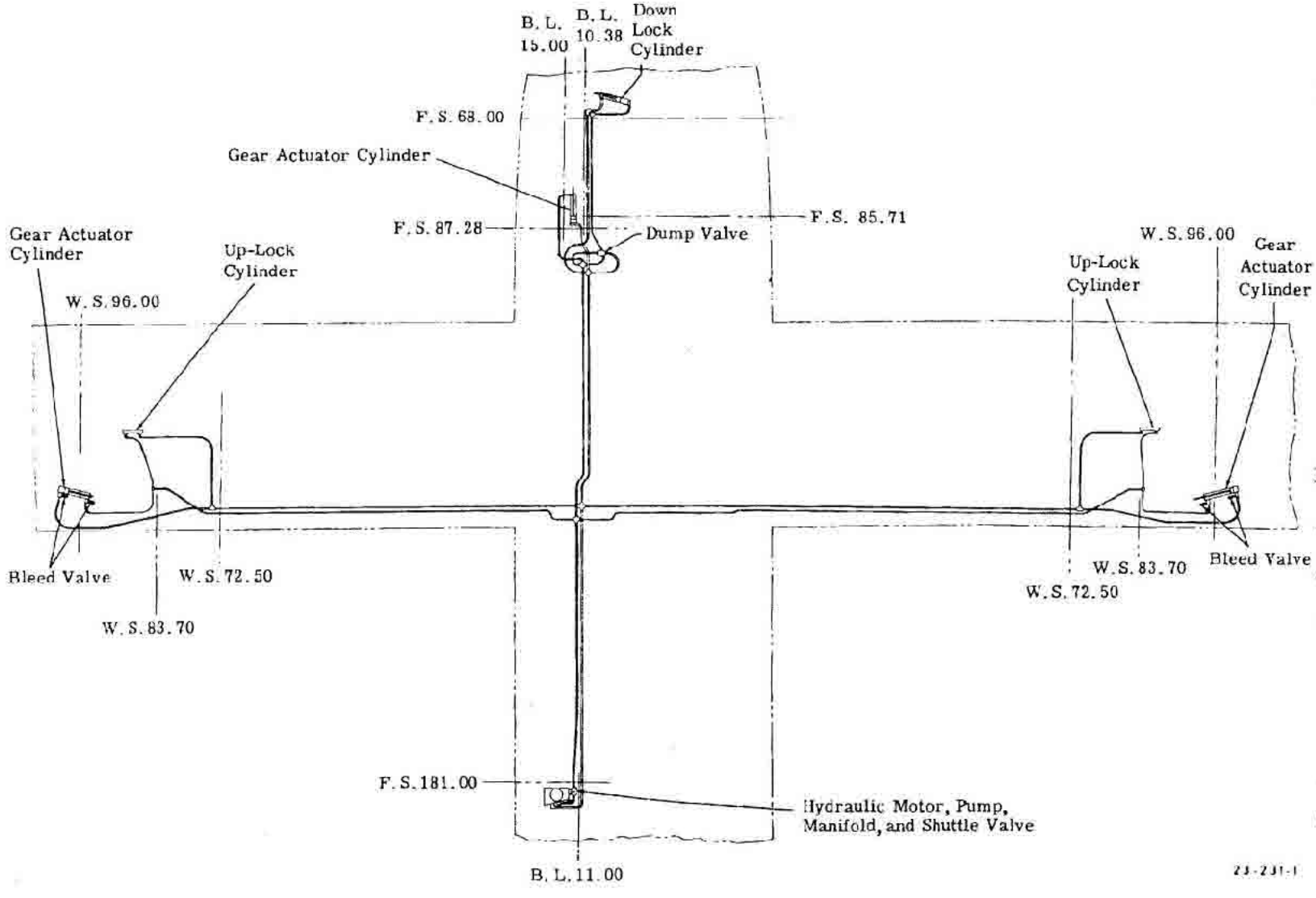


Figure 3-30. Landing Gear Hydraulic System

NOTE

The pump will cycle on during fluid bleeding. Make sure the reservoir does not run dry.

g. Retorque the "B" nuts at the cylinders.

h. With the gear extended, apply only enough pressure at the drag brace to actuate the down limit switch until pressure is built up in the extend system.

i. Crack the "B" nut on the retract side of the main gear up-lock cylinder and the extend side of the nose gear downlock cylinder and allow hydraulic fluid to bleed until clear.

NOTE

Pressure will bleed off and can be rebuilt as described in step h as required.

j. After retorqueing the "B" nuts, fill the reservoir and cycle the gear 6 complete cycles.

k. Cycle the gear and check the retract time. If the retract time exceeds 16 seconds, repeat the bleeding procedure.

l. Remove external power from the aircraft.

LANDING GEAR WARNING HORN SWITCH ADJUSTMENT

a. Set the parking brake, chock the wheels and start the engine.

b. Advance the throttle until the manifold pressure gage registers 12 inches Hg., with the propeller in low pitch.

c. Move the mixture control to "IDLE CUT-OFF" position and stop the engine, leaving the throttle in the same position.

d. Adjust the switch on the throttle control until the cam clicks the switch closed.

e. Make a flight test to determine if the warning system functions properly.

LANDING GEAR SAFETY SWITCH ADJUSTMENT (PITOT PRESSURE SWITCH)

A pressure switch in the landing gear retract electrical system prevents inadvertent retraction of the landing gear before flying speed is attained. The switch is mounted on the upper left side forward of the instrument panel and is actuated by pitot system pressure. The switch may be adjusted as follows

a. Place the aircraft on jacks.

b. Pressurize the pitot system to indicate 68-72 mph on the airspeed indicator.

c. Adjust pitot pressure switch adjusting screw clockwise to increase or counterclockwise to decrease. At any indicated airspeed below 68 mph indicated airspeed, the landing gear should not retract.

BRAKE SYSTEM

BRAKE LINING AND DISC WEAR LIMITS

Brake wear limits may be determined on aircraft serials prior to MB-522, M-1362, MC-98 and MA-369 as follows: Set the parking brake and measure the distance between the brake disc and the flat surface of the brake housing (parallel to the disc) near the center of the disc face. When the space between the disc and the flat surface of the housing is (or exceeds) .312 (5/16) inch, lining replacement is required. Replace brake disc when brake disc thickness has worn to .225 inch

On aircraft serials MB-522 and after, M-1362 and after, MC-98 and after, the brake wear limits may be determined as follows:

Replacement of the linings is required when lining thickness is .107 inch.

Measure the thickness of the disc. If the disc has excessive scoring or is less than .205 inch thick the disc should be replaced.

Complete information on brake, wheel and tire maintenance is contained in Beech Aircraft Corporation Manual 98-33661 for aircraft prior to serials MB-522, M-1362, MC-98 and MA-369. For aircraft serials MB-522 and after, M-1362 and after, MC-98 and after, Beech Aircraft Corporation Manual 98-37045 should be used. The appropriate manual for your aircraft is included in the loose tools and accessories kit.

BLEEDING THE BRAKE SYSTEM

Before ground tests are run, the brake system must be bled to make sure no air is trapped in the hydraulic lines. Use only MIL-H-5606 hydraulic fluid in the brake lines and do not allow dirt or foreign matter to enter the brake system. Dirt can work under seals and cause the brakes to lock.

Use either gravity flow or pressure bleeding to bleed brakes. Using either method, the parking brake lever and toe brake pedals must both be fully released to open the compensating port in the brake master cylinders.

GRAVITY BLEEDING

The reservoir(s) must be kept full during bleeding. The brake pedals should be operated slowly and smoothly to eliminate trapped air in the master cylinders. Also the bleed screw in the wheel cylinder head must be rotated to the far upward position to allow for the complete escape of air at this point. To position the bleed screw upward, compress cylinder head sufficiently to permit rotation. When no more air bubbles appear in the fluid drained from the bleeder screw opening, replace the bleeder screw.

NOTE

Replace the bleeder screw and fill the reservoir(s) after each operation and before releasing the brake pedal.

PRESSURE BLEEDING (M-1 thru M-1034, MA-1 thru MA-233 and MB-1 thru MB-264)

Remove the bleeder screw from the wheel cylinder, insert an adapter and connect the hose from a pressure pot to the adapter and bleed the system from the wheel cylinder up. Remove the filler plug from the top of the master cylinder. Connect a hose to the filler plug opening and place the opposite end of the hose in a large, clean container. Bleed the system until all bubbles are gone from the draining fluid.

PRESSURE BLEEDING (M-1035 and after, MA-234 and after, MB-265 and after and MC-2 and after)

Connect the hoses from a pressure pot to the bleeder openings on the brakes and bleed the system from the wheel cylinders up. Disconnect the fluid supply line at the reservoir. Attach a hose to the fluid supply line and put the other end of the hose in a large, clean container. Using not more than 30 pounds pressure, bleed the system until all air bubbles are gone from the draining fluid. Pumping the brakes is not necessary.

BLEEDING DUAL BRAKE SYSTEM

NOTE

Effective M-1286, MA-367, MB-482 and MC-2 the brake shuttle valves for the dual brake installation were removed. The bleeding procedure is essentially the same except it is no longer required to bleed the copilot's side of the system. The entire system may be bled by operating the pilot's brake pedals.

When the dual brake system is installed, the copilot's brake system is bled by closing the valve on the pressure pot and pumping the copilot's brake pedal to change the shuttle valve position. This causes hydraulic fluid to be routed through the copilot's system; this system should be bled as was the pilot's system.

NOTE

Trapped air at the shuttle valve may prevent a change in valve position when brake pedals are pumped. If this condition exists, disconnect the hose at the shuttle valve and move the valve with a small drill bit or wire until closed. Connect hose and continue bleeding operation.

PARKING BRAKE ADJUSTMENT

(M-1 thru M-1034, MA-1 thru MA-233 and MB-1 thru MB-264)

When adjusting the parking brake the chain must be adjusted so that the parking brake will not be set inadvertently when full rudder and brake is applied.

(M-1035 and after, MA-234 and after, MB-265 and after and MC-2 and after)

a. Loosen the lock nut and screw securing the control cable wire to the parking brake valve arm.

b. Push the control all the way in (forward) and parking brake valve arm forward. Tighten the screw and the lock nut.

c. Check for proper operation by pulling the control knob out and then pumping the pedals. To release the parking brake, push the control knob in.

RUDDER TORQUE TUBE MAINTENANCE

NOTE

Nylon bearings should not be installed at the outboard end of each of the rudder pedal torque shafts. With nylon bearings installed at these points, friction buildup may be great enough to offset directional stability requirements.

On M-2 thru M-554, the pilot and copilot rudder pedals are inter-connected by four nylon gears pinned to the rudder torque tubes. The gears can be visually inspected by removing the cabin bottom inspection door or the Royalite fairing covering the pilot's rudder torque tube in the cabin. When removing or replacing the four nylon gears proceed as follows:

a. Remove the two front seats. (See step a, WING REMOVAL.)

b. Remove the covers at the rudder pedals.

c. Disconnect the brake master cylinders at the rudder pedal attaching lugs.

d. Remove the pilot's rudder torque tube supports and the pilot's rudder pedals from the rudder torque tubes.

e. Remove the forward inspection plate from the fuselage bottom to expose the lower rudder pedal assembly.

f. Remove the nuts from the taper pins in the nylon gears and drive out the pins. Slide the nylon gears off the torque tube.

g. Install and position the new metal gear on each torque tube with the pilot holes in the gear down and aligned with the holes in the torque tube.

h. Align the copilot's rudder pedals to the neutral position and adjust the nylon gears to mesh and to permit the rudder to reach full travel in either direction.

i. To hold the gears and torque tubes in alignment as established in step h, install the inboard torque tube support over the torque tubes and secure the support.

j. Secure each gear, except the gear to be drilled and reamed, with a 1/4 inch bolt positioned in the hole of the gear and torque tube. This prevents movement of the other gears during the drilling procedure.

k. From the bottom of the rudder pedal assembly drill a 1/4 inch hole through the gear using the existing pilot hole as a guide. Then from the top side of the rudder pedal assembly, taper ream the 1/4 inch hole downward

through the gear and tube with a No. 2 Brown and Sharp taper reamer. Install the taper pin and secure. Use the same procedure for the remaining gear.

NOTE

It is important that the hole drilled in the gear be straight and not elongated. To best accomplish this it is recommended that a 90° angle or snake drill attachment be used in the drill motor.

l. Reinstall parts removed during disassembly. On serials M-555 and after, MA-1 and after, MB-1 and after and MC-2 and after, the pilot and copilot's rudder pedals are interconnected by two actuating tubes having adjustable ends which connect to arms pinned to the rudder torque tubes and to a bell crank assembly attached to a bracket in the control column pedestal directly aft of the firewall. When removing or replacing the rudder pedal bell crank assembly proceed as follows:

1. Remove the nose assembly and firewall (see ENGINE REMOVAL).
2. Disconnect the actuating tubes at the arms on the rudder torque tube.
3. Remove the control column boot retainer strip to gain access to remove the 1/4 inch bolt attaching the bell crank to the bell crank assembly bracket in the pedestal.
4. Remove the 1/4 inch bolt.
5. Work the bell crank assembly aft to clear the attaching bracket then bring forward through the large hole in the pedestal.
6. Reverse the above procedure upon reinstallation. The raised identification numbers should be on the top side of the bell crank when properly installed.

NOTE

Place rudder pedals in the neutral position prior to final adjustment of the actuating tubes.

STALL WARNING SENSING SWITCH
(Figure 3-31)

The stall warning switch is located on the leading edge of the left wing. The entire switch will move up or down by loosening the two screws on either side of the switch. Pushing the switch back and down will cause the switch to activate later. Pushing the switch up and forward will cause the switch to activate sooner.

Do not try to adjust the switch by bending the vane.

One-fourth inch movement of the vane will affect the activation approximately 5 mph.

The stall warning should be set to activate at 5 to 7 mph before actual stall.

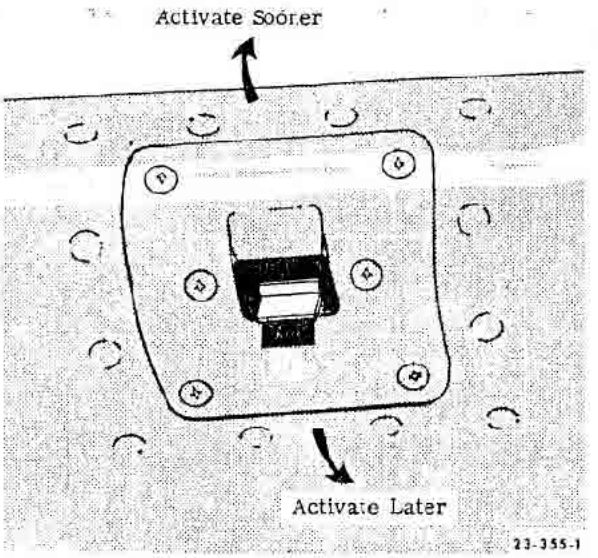


Figure 3-31. Stall Warning Sensing Switch Adjustment

WINDSHIELD AND WINDOW REPLACEMENT

WINDSHIELD REMOVAL

a. Remove compass, glareshield, upholstery trim, etc., around the windshield, and the outside air temperature indicator.

b. Drill out all rivets which secure the windshield in place and remove the upper seven AN525-8R9 screws on each side of the windshield frame. Disconnect the speaker if connected to the frame.

NOTE

Place a cloth over the instrument panel as a protection from falling rivets etc.

c. Loosen the windshield by slowly working a thin, beveled edge, phenolic strip all the way around the windshield frame and the fuselage. Avoid bending or damage to airframe skin.

d. Remove the windshield from the fuselage.

WINDSHIELD INSTALLATION

a. Remove all existing bonding material from the fuselage.

b. Trim the frame edges of the new windshield as necessary for fitting.

c. Position the windshield to the fuselage. Maintain approximately 1/16 inch clearance between the glass and the upper fuselage frame at station 94.00 on the inside of the cabin.

c. Position the windshield to the fuselage. Maintain approximately 1/16 inch clearance between the glass and the upper fuselage frame at station 94.00 on the inside of the cabin.

d. Apply firm pressure on the outside of the windshield and back-drill through the existing holes in the fuselage. A No. 30 hole finder used on the lower front windshield frame will facilitate drilling. Install a Cleco fastener in each hole after back-drilling. If necessary 1/8 inch rivets may be replaced by 5/32 inch rivets where a hole has been elongated.

e. After the windshield frame has been drilled and fitted, remove the windshield and deburr.

f. Determine final fit of the windshield by repositioning to the fuselage.

g. Remove the windshield and apply liberal amounts of EC 1792 sealer (product of 3M, Minnesota Mining and Manufacturing Co., Minneapolis, Minnesota) or equivalent, to the windshield frame.

h. Reinstall the windshield and rivet as soon as possible to the airframe.

i. Allow 24 hours curing time before the windshield frame is cleaned and painted.

j. Reinstall the outside air temperature indicator, compass, glareshield, upholstery trim, etc.

CABIN WINDOW REPLACEMENT

Cabin windows are sealed to the fuselage skin and may be removed by applying heat and then inserting a sharp instrument, such as a knife blade, between the pane and the skin.

NOTE

On aircraft serials M-1358 and after, MB-519 and after and MC-97 and after, attach screws are installed through the fuselage skin and window on the second and third window. Before window removal these screws must be removed. Reinstall the screws when the window is installed.

CAUTION

Avoid damage to the exterior skin, such as nicks and creases, when performing the above operation.

To install a new cabin window, drill three matching, evenly spaced holes in each edge of the glass and the fuselage skin. Clean the surfaces of the window and the fuselage skin. Apply liberal amounts of a mixture of 160 grams of EP 711 B-1/2 sealer (product of Coast Pro-Seal and Manufacturing Co., Los Angeles, California) or equivalent, to the inside skin of the window area.

On aircraft prior to serials M-1285, MA-364 and MB-3, with the glass positioned to the inside skin of the window opening, support the glass with 1/2 x 1/2 inch aluminum angles attached through its pre-drilled holes in the glass and skin and allow the sealer to cure before removing the supporting angles. Install a screw, nut and washer in the center fore and aft holes and fill the remaining open holes. After the hole filler has cured sufficiently, sand the fill smooth and repaint the area. After the left hand win has been completely installed and the sealer sufficient cured, install the storm window. Effective with serials M-1285 and after, MA-364 through MA-368, MB-3 and after and MC-2 and after, the installation of a new window would be much the same except the windows have a curvature and use of the previously mentioned angles at the fore and aft ends of the window will not be practical. To retain these curved windows until sealer curing is complete, install screws in each of the holes after the sealer is applied and the glass is in position. Remove all screws except the two center fore and aft screws after curing and fill the holes as described for the flat glass on earlier models.

CABIN DOOR LATCH RIGGING

a. Remove the lower door upholstery panel and the trim from around the window.

b. Adjust the turnbuckle attaching the cable to the latch to lengthen or shorten the cable as desired. Adjust both lower and upper latch to obtain proper closure.

c. Install the lower door upholstery panel and the trim around the window.

STORAGE

Outside storage for a short period is practical due to the metal construction of the aircraft, however, inside storage of any aircraft is always preferable.

The following steps should be taken in the event short term storage is required:

a. Arrangements should be made to have the airplane flown at least 30 minutes each week in order to keep the internal parts of the engine lubricated. Ground running of the engine will not provide proper heating of the oil without possible damage to other engine compartment components due to lack of air flow, and will result in condensation of moisture in the oil supply, increasing the possibility of cylinder/crankshaft rust.

b. Keep the fuel tanks full to minimize vapor and to help prevent condensation.

c. Storage should be preceded by a thorough cleaning of the aircraft inside and out.

ENGINE PRESERVATION

If the engine is to remain in an inactive status, the following preservation measures should be taken.

a. Run engine at 1200 to 1500 rpm for five minu with oil sump filled with MIL-C-6529 Type II Corros Preventive Compound. Inject the same type of corrosion preventive compound through the carburetor air box at the

rate of 1/2 gal. per minute until smoke comes from the exhaust pipe; then increase the flow until it stops the engine.

b. Remove all spark plugs and spray MIL-C-6529 Type II compound into the spark plug holes. This compound should be at a temperature of 150°F to 180°F. Install dehydration plugs (AN4062-11) in the upper spark plug holes. Replace the lower spark plugs. Secure plastic spark plug lead wire protector caps (AN4060-1) over the ends of the lead wires and connect over the ends of the dehydrator plugs. Connect lower spark plug leads and wrap the remaining plugs in Grade "A" moisture barrier paper and place inside the baggage compartment.

NOTE

Once the engine has been preserved, the propeller MUST NOT BE ROTATED. Movement of the crankshaft will provide an unpreserved area which may rust.

POWER PLANT

EXHAUST SYSTEM

It is recommended that the exhaust muffler be removed and the exhaust muffler examined for deterioration and possible leaks every 100 hrs. See HEATER MUFFLER INSPECTION in Section 2.

ENGINE CONTROLS

The engine controls are centrally located in a console arrangement for ease of operation from either the left or right seat on serials M-2 thru M-12 and M-1415, M-1419, M-1423, M-1439 and M-1447, MA-1 thru MA-368, MB-1 thru MB-557 and MC-2 thru MC-150. The throttle incorporates both a locking button and a vernier arrangement for fine adjustments. The mixture control is locked with a clockwise turn of the friction nut located on the forward side of the knob. On aircraft equipped with a constant speed propeller, the propeller control incorporates both a locking knob and a vernier arrangement for fine adjustments. The control is pushed in to increase rpm (low pitch) and pulled out to decrease rpm (high pitch).

Aircraft serials M-1413 and after except M-1415, M-1419, M-1423, M-1439 and M-1447, MB-558 and after and MC-151 and after, utilize a quadrant control arrangement mounted in the center of the instrument panel for engine controls. The throttle control lever is on the left, the propeller control lever (serials MC-151 and after only) or carburetor heat control lever is in the middle and the mixture control lever is on the right. A friction lever, located on the right side of the quadrant, precludes control lever travel due to vibration.

RIGGING THE THROTTLE CONTROL

Whenever replacement of the vernier type throttle control is necessary or throttle control rigging is necessary, the control should be so rigged that, when the control is making full throttle contact at the throttle body, a maximum gap of 1/16 inch remains at the instrument panel (see Figure 3-32).

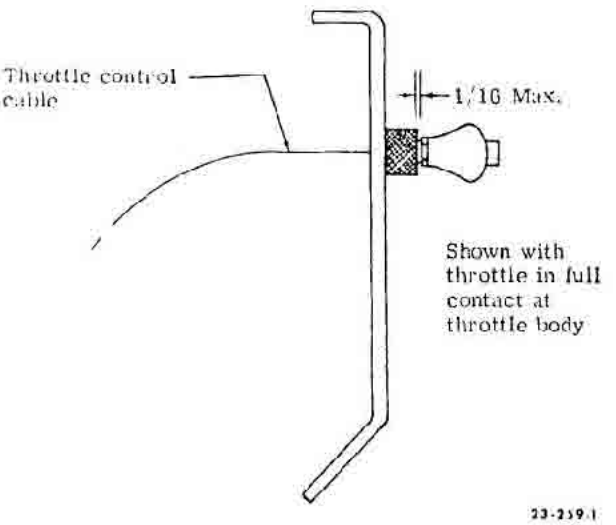


Figure 3-32. Throttle Rigging

QUADRANT CONTROL RIGGING

The quadrant controls may be rigged as follows:

a. Rig each control so that full travel (stop to stop) is obtained before the levers make contact with the quadrant cover.

b. The forward position of the levers should be full throttle, low pitch (high rpm) or full cold, and full rich.

c. Binding of the controls is not permitted. With friction device off, controls must be preloaded so that a force of 3-5 lbs. is required at center line of knobs and perpendicular to direction of travel to move control levers forward or aft.

MIXTURE CONTROL AND CARBURETOR HEAT CONTROL CABLES INSTALLATION

The mixture control or carburetor heat control cables installation may be accomplished as follows:

a. Remove the engine cowling.

b. Lubricate the new cable with an aerosol silicone lubricant before installation.

c. Thoroughly clean the control shaft and control cam faces with alcohol.

d. Lubricate both cam faces and the entire exposed area of the control shaft with an aerosol silicone lubricant

NOTE

When installing the control cable, it MUST BE installed in the following sequence: (1) Bolt; (2) Control Arm; (3) Washer; (4) Control Cable; (5) Washer or Washers as required; (6) Nut. Torque the nut 15-20 inch-pounds.

WARNING

DO NOT install any washers under the head of the bolt (see Figure 3-32A).

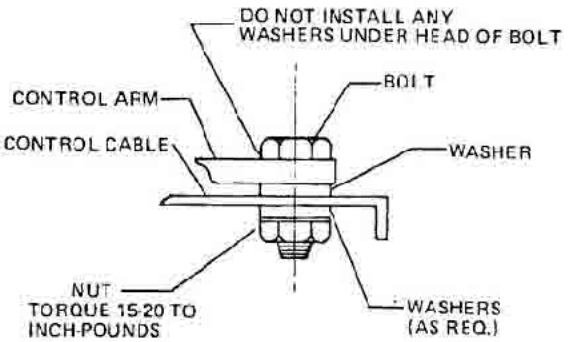


Figure 3-32A. Mixture and Carburetor Heat Control Cable Installation

e. Rig the control cable and inspect the control housing between the Vernier Control/Quadrant Control and firewall for kinks and check the operation of the control from the Vernier Control/Quadrant Control for freedom of movement, applying silicone lubricant as necessary in order to obtain maximum ease of operation. Be certain that full travel of the control cam and shaft is obtained. Check under the instrument panel for clearance between the control cable and the control column throughout the full travel of the control column.

f. The bolts which attach the mixture control cable to the carburetor mixture control arm and the carburetor heat control cable to the carburetor air box arm must be inspected for freedom of rotation and proper installation.

g. In the event the bolt does not rotate freely, refer to Figure 3-32A and adjust washers as necessary to lock the control in the bolt and obtain free rotation of the bolt in the arm. Torque the nut 15-20 inch-pounds.

h. Reinstall the cowling.

Follow the preceding procedures when it is necessary to disconnect, replace, repair or adjust the mixture control cable and/or the carburetor heat control cable at the engine end.

Lubricate the cam faces and control shaft every 25 service hours with lubricating oil (Item 11, Consumable Materials Chart). Refer to Figure 2-17, Lubrication Diagram.

Engine removal and installation procedures as described below are for detaching the engine from the five firewall mounts and removing the entire nose section with engine intact. The engine can also be removed as a unit by detaching it from the four Lord mount bolts at the engine supports. This leaves the nose assembly attached to the fuselage and the nose wheel providing support for the aircraft. When removing and installing the engine in this manner, disregard steps below that are not applicable.

a. Remove the cowling.
b. Place tail stand under the tail tie-down lug.

CAUTION

The airframe may still be nose-heavy after the engine is removed depending on equipment and loading. A minimum of 150 pounds should be added to the tail stand.

c. Attach a hoist (1000 lb. capacity) to the engine lifting eye and take up the slack.

CAUTION

Do not attempt to raise the engine until it is free from the mounting bolts.

d. Remove the engine control panel from the main instrument panel (push forward), then disconnect the flexible cable from the tachometer.

e. Turn off the fuel selector valve and disconnect the fuel lines at the firewall.

f. Disconnect the nose gear steering linkage at the adapter on the nose gear.

g. Remove the five engine mount attaching bolts from the forward side of the firewall and move the engine section forward to permit disconnection of the following items:

NOTE

Make sure side pressure is not applied on the nose gear steering linkage to prevent bending loads on the rod end at the arm on the rudder pedal torque shaft.

1. Starter cable.
2. Windshield defroster.
3. Vacuum line.
4. Electrical connections.
5. Fuel and oil pressure lines.
6. Primer line.
7. Brake system hydraulic reservoir line where applicable.

ENGINE INSTALLATION

a. Attach a hoist to the engine lifting eye; position the engine section to allow connection of the pressure lines, tubes and wires.

b. Install the engine mounting bolts and torque the applicable bolts as follows:

1. Engine mount to firewall bolts 325 + 0 - 20 inch-pounds.

2. Engine Lord mounts to engine supports -75 ± 25 inch-pounds.

c. Reinstall and connect the component systems in the reversal of the removal procedure.

NOTE

When reinstalling engine, remove the old seal from the firewall and fuselage bulkhead. Reseal with non-hardening type seal. Sealer P/N 576 Permagum is available through your BEECHCRAFT Sales and Service Outlets.

CAUTION

The crankcase vent breather line must extend below the lower surface of the cowl and should be checked each time the cowl is reinstalled. The scarfed edge should be facing aft. If the bottom portion of the breather line is broken the line must be replaced to ensure proper ventilation in the crankcase.

d. Install cowling.

ENGINE MOUNT INSTALLATION

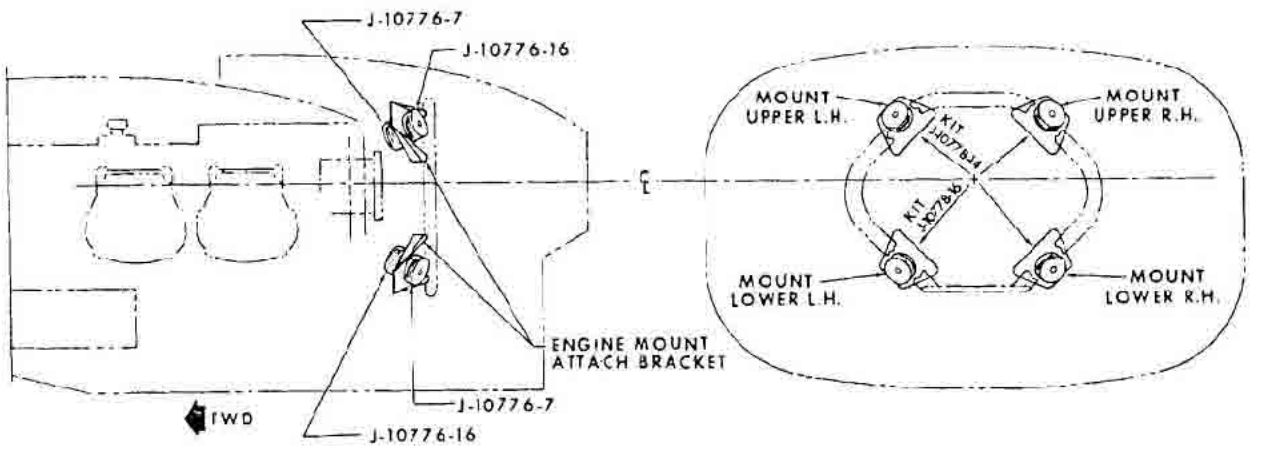
When installing the Lord engine mount kits for the IO-360 engine on airplane serials MA-1 and after and MC-2 and after, they must be installed in the following sequence:

a. The upper LH or upper RH mount must be installed with the J-10776-7 mount located forward of the engine mount attach bracket and the J-10776-16 mount located aft of the engine mount attach bracket. The J-12891-1 spacer is used in the upper LH and lower RH mount locations and must be used in these locations only.

b. The lower RH or lower LH mount must be installed with the J-10776-7 mount located aft of the engine mount attach bracket and the J-10776-16 mount located forward of the engine mount attach bracket. The J-10931-2 spacer is used in the upper RH and lower LH mount locations and must be used in these locations only.

NOTE

The Lord engine mount kits must be installed in these locations only.



MA-1 AND AFTER
MC-2 AND AFTER

19-241-28

Figure 3-32B. Engine Mount Installation

COWLING MODIFICATION

A split nose cowl modification may be made on the BEECHCRAFT Musketeers, serials M-1 through M-1068, MB-1 through MB-288 and MA-1 through MA-272, which will reduce manhours by permitting the removal of the engine cowling without having to remove the propeller. The complete parts and instructions required for the modification are contained in Kit No. 23-9006 M.

TROUBLESHOOTING THE FUEL INJECTION SYSTEM

(MA-1 through MA-368 and MC-2 and after)

Two items cause the most trouble in the RSA-5AD1 fuel injection system: (1) Dirt in the system; (2) Fuel leakage through a certain area of the control. Both will cause rough idle, poor acceleration and low fuel flows. When either condition exists, use the following procedures:

DIRT IN THE FUEL INJECTION SYSTEM

Idle the engine for two to three minutes, and then check the cylinders to see if one or more are cool. If a cool cylinder is found, use the following procedure:

a. Remove all nozzles and clean by soaking them in acetone or methyl-ethyl-ketone.

NOTE

Do not disassemble nozzles.

b. With the mixture lever closed, the throttle lever open and the nozzle lines raised up, turn the boost pump on and open the mixture lever until fuel begins to drip out each nozzle line. The amount of fuel dripping from each line should be equal. If not, either the line or a flow divider port may be plugged.

c. Remove the nozzle lines and follow the same procedure described in step "b" at the flow divider fittings. This will eliminate the nozzle line as the problem.

d. If the fuel flow from the flow divider ports is unequal, this indicates the flow divider is plugged. Clean the flow divider as follows:

1. Loosen the four screws in the top of the flow divider.
2. Rap the top cover with a plastic hammer to disengage the cover. Remove the screws, being careful not to lose the spring positioned between the cover and the diaphragm.
3. Remove the cover, spring and diaphragm. This will include the valve.
4. Disconnect the fuel flow gage line from the divider
5. Use air pressure to back flush the nozzle lines and flow divider ports.
6. Turn the boost pump on and open the mixture lever to allow fuel to run out of the top of the flow divider.
7. Reassemble the flow divider and connect the fuel flow gage line.

e. Install the nozzles on the nozzle lines. Do not install the nozzles in the cylinder ports.

f. With the nozzles in a horizontal position and the throttle lever open, turn on the boost pump and gently open the mixture lever. Fuel should begin to drip from each nozzle in an equal amount.

g. Open the mixture lever until a forced stream of fuel is coming from the nozzles. Place a finger over the outlet end of each nozzle. Fuel will then come out the screen shield on the nozzle. This will indicate the air bleed port is open.

h. Reinstall the nozzles in the cylinder ports with the bleed air ports up and toward the rear of the engine as much as possible. The bleed air port is on the side of the nozzle opposite the letter "A" stamped on the hex section of the nozzle.

LEAKAGE AT THE FUEL CONTROL

a. Disconnect and cap the fuel line, between the injector and the flow divider, at the flow divider.

b. Remove the induction air filter.

c. Open the throttle and mixture levers.

d. Operate the boost pump for 15 seconds.

e. If fuel is leaking into the induction air duct, the fuel injector should be removed and sent to overhaul for repair.

f. If no leakage is observed, remove the cap and reinstall the fuel line and filter removed in step "a" and "b".

NOTE

Allowing the aircraft to remain out of service for prolonged periods may result in the drying out of the "O" ring seal between the mixture and idle valve plugs, which then allows the idle plug to adhere to the "O" ring and mixture plug. The mixture plug which is held secure by its "O" ring seal does not allow the idle plug to swivel so it can seat solidly on the face of the idle valve, which then will allow improper metering by the idle valve until the area is again lubricated by fuel. A rough idle and poor cut-off are symptoms of a rich mixture.

A fix for this is to obtain a wooden rod long enough to go through to the end of the idle valve shaft on the injector, then with a shove, push the valve shaft inward approximately 1/4 inch, which will move the entire assembly towards the mixture valve shaft; then apply the same pressure on the opposite end against the mixture shaft to push the assembly back in place. This will disengage the two valves and again allow universal action of the idle valve and plug.

CAUTION

Do not use a hammer or like object, use only hand pressure.

IDLE SPEED AND MIXTURE ADJUSTMENT (CARBURETED MODELS)

On aircraft equipped with carburetors, the following procedure is recommended for setting the idle speed and idle mixture. Setting should be made with oil temperature at least 120°F.

a. Start the engine and warm up until oil temperature is normal, minimum of 120°F.

b. Check the magnetos. A maximum of 125 rpm drop on either magneto and not more than 50 rpm difference between magnetos is within tolerance.

c. Adjust the throttle stop screw to provide 550 ± 25 rpm (650 ± 25 rpm for O-360 engines).

d. Apply the throttle to clear the engine and return the throttle to the idle position.

e. Smoothly and steadily move the mixture control to the idle cut-off position and observe the tachometer for a change in rpm. Do not allow rpm to decrease enough to cause the engine to quit.

f. An increase of more than 25 rpm while leaning indicates a rich mixture. An immediate decrease in rpm (not preceded by a momentary increase) indicates an excessively lean idle mixture.

g. Shut down the engine and adjust the idle mixture as necessary to obtain a maximum of 25 rpm rise when leaning. To lean the idle mixture turn the idle mixture control screw counterclockwise and to richen turn the idle mixture control screw clockwise.

h. Start the engine and clear it by advancing the throttle to approximately 2000 rpm after each adjustment.

i. After adjusting the idle mixture to obtain the proper 10-25 rpm rise, clear the engine and check the idle speed again. Readjust the throttle stop screw as necessary to obtain 550 ± 25 rpm idle speed (650 ± 25 rpm for O-360 engine).

NOTE

Do not attempt to check the idle mixture or idle speed with the cowling removed or false roughness will be encountered due to improper induction air flow.

IDLE SPEED AND MIXTURE ADJUSTMENT (BENDIX FUEL INJECTION)

a. Check magneto-drop in accordance with the procedures given under MAGNETO CHECK.

b. With normal "mag-drop" apparent, close the throttle to idle (approximately 650 rpm). If radical rpm changes result after making the following idle mixture adjustments, readjust the idle speed to the desired rpm.

c. When the idling speed has been stabilized, move the cockpit mixture control lever with a smooth, steady pull, into the IDLE-CUT-OFF position and observe the tachometer for any change during the leaning out process. Caution must be exercised to return the mixture control to the FULL-RICH position before the rpm can drop to a point where the engine cuts out. An increase in rpm while leaning out indicates the idle mixture is on the rich side of best power. An immediate decrease in rpm (if not preceded by a momentary increase) indicates that the idle mixture is on the lean side of best power.

d. The desired idle setting is a compromise between one that is rich enough to provide a satisfactory acceleration under all conditions and lean enough to prevent spark plug fouling or rough operation. A rise of 25-50 rpm will usually satisfy both of these conditions.

e. If step b. indicates that the idle adjustment is too rich or too lean, turn the idle mixture adjustment one or two notches in the direction required (see step g) for correction, and check this new position by repeating step c. Make additional adjustments as necessary.

f. Each time an adjustment is changed, clear the engine by running it up to approximately 2000 rpm before making the mixture check.

g. Idle mixture adjustment is made by lengthening (richening) or shortening (leaning) the linkage between the throttle lever and the idle valve lever. The center screw assembly has right hand threads on both ends but one end has 24 threads and the other end has 32 threads. For easy reference, consider only the coarse thread end. When it is turned out of its block, the linkage is lengthened and a richer mixture is provided.

h. When the center screw bottoms out on either of the blocks and the idle adjustment is near the desired setting, measure the distance between the two blocks. Disconnect the spring from the most accessible linkage pin and remove the pin. Turn the block and adjustment screw until the adjusting wheel is centered and the distance between blocks is as previously measured. There is now additional adjustment range and the reference point is retained.

i. Make the final idle speed adjustment to obtain the desired idling rpm with closed throttle.

j. If the setting does not remain stable, check the idle linkage, any looseness in this linkage will cause erratic idling. In all cases, allowance should be made for the effect of weather conditions upon idling adjustment. The position of the aircraft to the direction of the prevailing wind will have an effect on the propeller load and its rpm. It is advisable to make the idle setting with the aircraft cross-wind.

k. When the idle speed and mixture adjustments are made according to the procedures above, very little further attention will be required except for extreme variations in temperature and altitude.

FUEL INJECTION SYSTEM ADJUSTMENT
(Continental IO-346 Engines)

Erratic idle and poor throttle acceleration response may be caused by misadjustment of the fuel metering system. The following fuel injection system adjustment procedure is recommended for best operation.

a. With the engine running at 600-650 rpm and the mixture control at full rich, set the idle mixture adjustment screw, located on the fuel metering unit cover, so the engine speed will increase approximately 50 rpm by leaning the manual mixture control. The screw turns clockwise (in) to lean and counterclockwise (out) to richen.

b. Connect a calibrated pressure gage between the fuel pump outlet and the metering unit inlet, but as close to the pump as practical.

c. Set the fuel pump pressure at 7-9 psi with the engine running at 600-650 rpm. The hex-headed screw at the aft end of the pump turns clockwise to increase pressure and counterclockwise to decrease pressure. It may be necessary to readjust the idle mixture after setting the pump pressure (see step "a" for idle mixture adjustment).

d. With the engine running at 1000-1200 rpm, observe the fuel pump pressure, engage the boost pump to give a definite rise in pump pressure, switch off the boost pump, and observe the stabilized pressure. The pressure should return to the initially observed pressure ± .25 psi. Repeat this procedure three or four times. If the stabilized pressure varies excessively, a pump malfunction is indicated.

e. The high pressure output of the fuel pump is such that the metered fuel pressure limits in flight are 12.2 - 14.0 psi at 2700 rpm full throttle, full rich. The metered pressure may be varied by resetting the idle pump pressure within the 7-9 psi range.

FUEL SELECTOR VALVE

The fuel selector valve should be checked at the 100 hour and annual inspection for proper engine shut down and freedom of movement. Adjustment to ensure proper function may be made in accordance with Service Instructions No. 0364-289 Rev. III.

NOTE

A new selector valve may be installed per Service Instruction No. 0838-289, at which time the inspection per Service Instruction No. 0364-289 may be discontinued.

WARNING

When working on the fuel selector valve make sure the handle is installed with the slot over the roll pin.

A subsequent valve used on current production aircraft has a spacer and a laminated washer under the handle in place of the washers called out in the above Service Instruction. Should the spacer and laminated washers wear, causing the valve to become stiff, additional washers may be added to eliminate the stiffness, however, engine shutdown should be in accordance with the above Service Instruction. Adjustments may be made by removing laminations from the washer.

MAGNETOS

(Figure 3-33)

BENDIX MAGNETO

After the first 25 hours and every 50 hours thereafter, the contact assemblies should be checked. Examine the points for excessive wear or burning. Points which have deep pits or excessively burned areas should be discarded. Examine the cam follower felt for proper lubrication. Clean breaker compartment with a dry cloth.

If engine operating troubles develop which appear to be caused by the ignition system, check the spark plugs and wiring first before working on the magnetos. Should the trouble appear definitely in the magneto, install a replacement magneto which is known to be in satisfactory condition and send the defective magneto to a qualified overhaul shop for test and repair. Should this not be possible and an immediate check is necessary, the following visual inspection may provide the source of trouble:

a. Remove the harness outlet plate from the magneto and inspect for the presence of moisture and foreign matter on the rubber grommet and high tension outlet side of the distributor block.

b. With the harness outlet plate removed from the magneto, inspect the distributor contact springs for burning

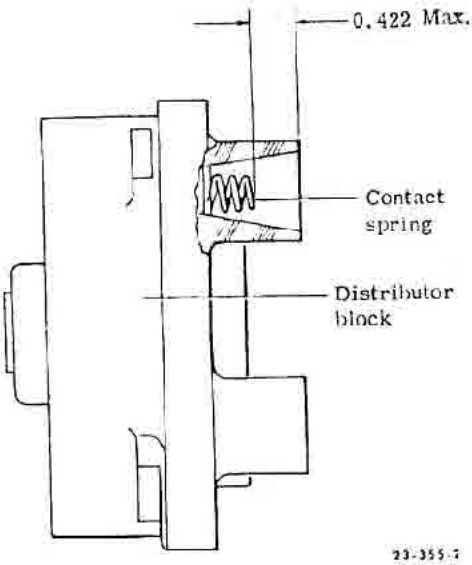


Figure 3-33. Magneto Spring Height

or other apparent damage. Remove defective springs and replace using the 11-8627 Spring Seating Kit (P/N Bendix Corp.).

Check the height of all the distributor block contact springs using a flush pin gage, small scale or other suitable measuring device. This dimension is determined by measuring from the top of the block outlet tower down to the top of the spring. Outlets in which the measurement is 0.422 inch or less contain acceptable contact springs. Outlets in which the measurement

exceeds 0.422 inch contain springs which are defective or have been improperly installed (two bottom coils of the spring caught in the recessed groove of the brass insert in the block). Using a pointed instrument, move the top end of the spring in a circular motion to be sure only the bottom turn of the spring is caught in the groove of the brass insert in the block. Recheck spring height as shown in Figure 3-33. If the dimension still exceeds 0.422 inch, replace the contact spring.

e. Check for broken leads or damaged insulation. If either exists, remove and replace the magneto.

d. Check the contact assemblies to see that the cam follower is securely riveted to its spring by removing the breaker cover and harness securing screws and nuts, and separating the cover from the magneto housing.

e. Check the contact points for excessive wear or burning. Desired contact surfaces have a dull gray, sandblasted or frosted appearance over the area where electrical contact is made.

NOTE

No attempt should be made to stone or dress contact points. Should contact assembly have bad points or show excessive wear, the complete contact assembly should be replaced.

f. Check the condenser (capacitor) mounting bracket for cracks or looseness.

g. Use a condenser tester or equivalent to check condition of the condenser. A capacity of 0.30 microfarads is considered minimum for a satisfactory condenser.

h. When all indications point to the magneto, check magneto to engine timing. If magneto malfunction is evident, remove the magneto for internal timing check and inspection. Complete information on magneto timing and maintenance will be found in the Engine Operator's Manual.

CAUTION

Treat the magnetos as hot whenever the ground lead is disconnected. To ground the magneto, connect a wire to switch lead at the filter capacitor and ground the wire to the engine case.

MAGNETO-TO-ENGINE TIMING (SLICK AND BENDIX MAGNETOS)

FIRING ORDER	DEGREES BTC WHEN BREAKER POINTS OPEN
1-3-2-4	25 (M-1 thru M-554)
1-3-2-4	24 (M-555 thru M-1094)
1-3-2-4	25 (M-1095 and after)
1-3-2-4	25 (MA-1 through MA-368)
1-3-2-4	25 (MB-1 and after)
1-3-2-4	25 (MC-2 thru MC-388 and MC-393)
1-3-2-4	20 (MC-389 and after, except MC-393)

MAGNETO GROUND CHECKS (SLICK AND BENDIX MAGNETOS)

A proper magneto check is important. Additional factors, other than the ignition system, affect magneto drop-off. They are load, power output, propeller pitch and mixture strength. The important thing is that the engine runs smoothly, because magneto drop-off is affected by the variables listed above. Therefore, make the magneto check in accordance with the following procedures:

a. Lycoming Engines: With the propeller in minimum pitch angle (controllable pitch propeller), set the engine to produce 50-65% power as indicated by the manifold pressure gage. The mixture control should be in the full rich position. At these settings, the ignition system and spark plugs must work harder because of the greater pressure within the cylinders. Under these conditions, ignition problems, if they exist, will occur. Mag checks at low power settings will only indicate fuel-air distribution quality.

NOTE

Airplanes that are equipped with fixed pitch propellers, or not equipped with manifold pressure gage, may check magneto drop-off with engine operating at approximately 2000 rpm; airplane serials M-1095 and after at approximately 2200 rpm.

b. Switch from both magnetos to one and note drop-off, return to both until the engine regains speed and then switch to the other magneto and note the drop-off, and then back to both. Normal drop-off is 100 rpm. Drop-off should not exceed 175 rpm, nor more than 50 rpm between magnetos. A smooth drop-off past normal is usually a sign of a too lean or too rich mixture.

NOTE

Do not operate on a single magneto for too long a period. a few seconds, 10 maximum, is usually sufficient to check drop-off and will minimize plug fouling.

Continental Engines: Run the engine at 1800 rpm and check the magnetos by operating each magneto individually and noting the resultant rpm. The difference between the magnetos when operated singly should not exceed 50 rpm.

When engine performance during magneto check is unsatisfactory, inspect for incorrect grade of fuel, fouled or incorrectly gapped spark plugs, incorrectly timed magnetos, or incorrect fuel/air ratio.

NOTE

Do not operate on a single magneto for too long a period. a few seconds, 10 maximum, is usually sufficient to check drop-off and will minimize plug fouling.

SLICK MAGNETO

Serials MB-540, MB-553 and after, M-1672, M-1673, M-1674, M-1675, M-1677, M-1678, M-1679, M-1682, M-1684, M-1686, M-1687, M-1688, M-1693, M-1698, M-1702, M-1703, M-1705 and after utilize Slick 4000 series, non-servicable magnetos. It is recommended this magneto be run to a major engine overhaul and then exchanged for a factory rebuilt unit. The timing of the magneto to the engine should be checked every 200 hours.

PROPELLER

PROPELLER REMOVAL

(FIXED PITCH AND CONSTANT SPEED) (M-1 thru M-554, MA-1 through MA-368, MB-1 and after and MC-2 and after)
(Figure 3-34)

a. Remove the spinner retaining screws and remove the spinner, being careful not to damage the spinner or propeller blades. Mark the spinner and mating bulkheads for identical reinstallation.

b. Remove the propeller retaining bolts, (nuts on constant speed propeller), and remove the propeller assembly.

PROPELLER INSTALLATION

(FIXED PITCH AND CONSTANT SPEED) (M-1 thru M-554, MA-1 through MA-368, MB-1 and after and MC-2 and after)
(Figure 3-34)

a. Check and position the starter gear so that the hole

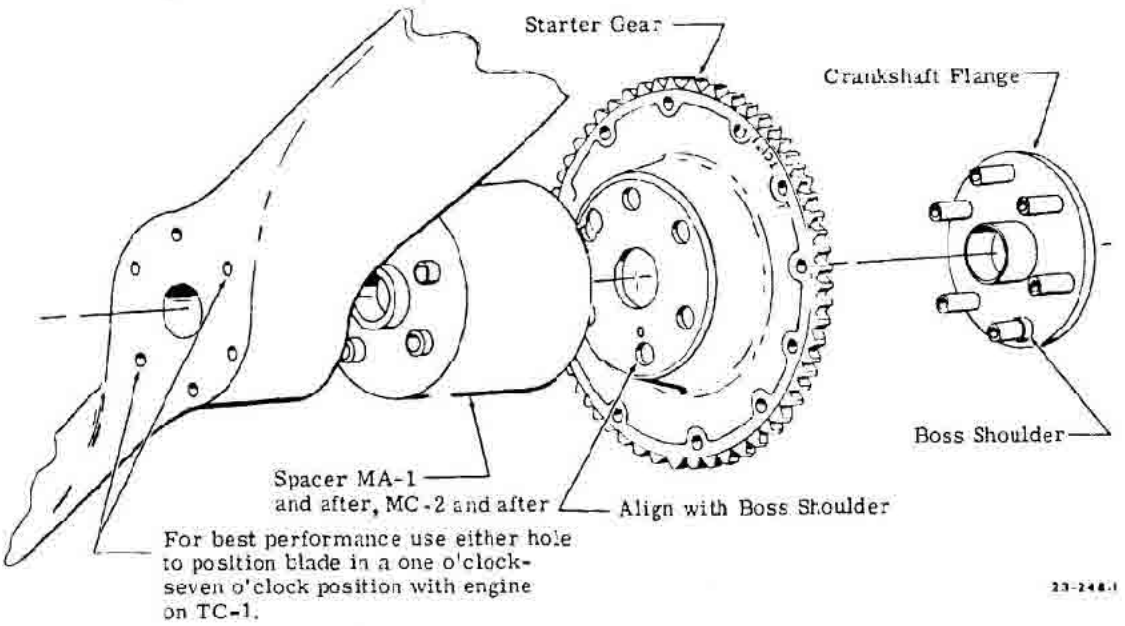


Figure 3-34. Propeller Installation

with "O" marking below it slips over the boss with the shoulder on the crankshaft flange as shown in Figure 3-34. On serials MA-1 and after, except the aircraft equipped with a constant speed propeller a spacer is installed between the starter gear and the propeller.

NOTE

On aircraft equipped with a constant speed propeller, a film of lubricant conforming to MIL-G-7711 should be applied to the "O" ring between the propeller hub and the engine crankshaft before propeller installation.

b. Install the spinner bulkhead on the prop hub.

c. Align the TC-1 timing marks on the starter ring gear and position the propeller in the one o'clock seven o'clock position when facing the aircraft.

d. Position the propeller assembly and install the propeller retaining bolts, (nuts on constant speed propeller).

e. Torque the retaining bolts to 300 inch pounds on serials M-1 thru M-554, and MB-1 and after. On serials MA-1 and after, except those aircraft equipped with a constant speed propeller, torque the retaining bolts to 720 to 780 inch pounds On aircraft equipped with a constant speed propeller, torque the retaining nuts to 660 to 720 inch pounds. Safety wire the retaining bolts or nuts after correct torque is obtained.

f. Place the propeller spinner on the bulkhead, aligning the marks which were made upon disassembly. Install the spinner attaching screws.

PROPELLER INSTALLATION

(FIXED PITCH) (M-555 and after)
(Figure 3-34)

a. Position the propeller to align the two propeller dowel pins with the dowel pin holes in the crankshaft flange.

b. Install the propeller retaining bolts, washers and nuts. Torque to 740 to 780 inch pounds.

Place the propeller spinner on the bulkhead, aligning the marks which were made upon disassembly. Install the spinner attaching screws.

PROPELLER BLADE REPAIR

(Figure 3-35)

Minor nicks, dents and gouges may be dressed out by approved line maintenance personnel. Blend any nicks or gouges into the leading edge with smooth curves and generous radii as shown in Figure 3-35.

For repairs of a more serious nature refer to BEECHCRAFT Sensenich Propeller Repair Manual 98-34643 or to Service Manual 660115. Extensive rework of leading or trailing edge contours should not be attempted in the field.

REPAIR OF FIBERGLASS

One of the advantages of the glass cloth laminated parts used in BEECHCRAFT construction is the ease with which

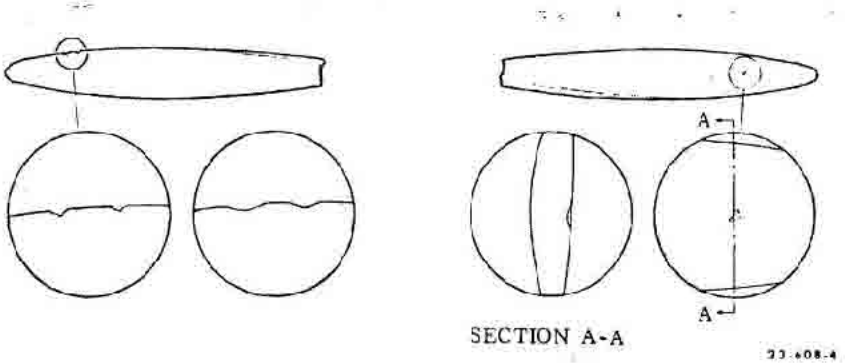


Figure 3-35. Minor Blade Repair

they can be repaired. Most repairs can be made with no more than sandpaper to prepare the surface, scissors to cut the glass cloth and a paint brush to apply the resin.

Laminated parts on Musketeers are made with American Cyanamid Lamanic 4123 polyester resin. This material is suitable for in-the-field repairs. For patching and repairing, polyester resin and glass cloth, which are used in the repair of fiberglass boats, may be used.

Where additional weight or thickness of the patch will not interfere with reinstallation or operation of the part, it is not necessary to cut out the damaged area as it will support the patch as it cures. If the damaged area must be cut out, trim just beyond all noticeable damage. Sand clean an area at least 2 inches larger than the hole or damage to be repaired. Cut three patches from glass cloth. Cut the first patch slightly smaller than the sanded area, and cut the second patch smaller so that about a half inch of the first patch is exposed; the third patch should expose about a half inch of the second patch.

Follow the manufacturer's instructions carefully in preparing the resin and mix small amounts that can be used up in 30 minutes or less. Always use clean brushes and containers as dirt or other contaminants will weaken the repair. Lay the patches on clean paper and brush resin into them until they are thoroughly saturated. Lay the largest patch over the hole or damaged area, smoothing out all wrinkles and bubbles. If the patch sags, it may be backed up from the opposite side with a suitable support that has been coated with automobile wax or covered with wax paper to keep the resin from sticking to it. Apply the second and third patches immediately and give the entire patch a coat of resin. After the patch has cured for 24 hours, it may be sanded smooth and painted, if necessary.

REPAIR OF CRACKS IN ROYALITE COMPONENTS

Most cracks in Royalite components such as tail cones and wing tips can be easily repaired, resulting in a reworked area that is equal or superior to the original material. Following is a general procedure for repair of cracks in Royalite parts.

a. Thoroughly clean both sides of the material in the affected area by sanding. If oil or grease is present, first clean the area with lacquer thinner, naphtha, or other acceptable degreasing solvent.

b. Prepare a Royalite adhesive by dissolving Royalite chips in methyl-ethyl-ketone. The solution should be thick, but capable of being poured. If desired, a commercial Royalite adhesive such as MP-1000 (Travis Plating Company, Inc., 12222 West Olympic Boulevard, Los Angeles 64, California), 3M-EC 776 or 3M-EC 847 (Minnesota Mining and Manufacturing Company, 411 Piquette Street, Detroit 2, Michigan), Pliobond 20 (Campbell Industries, 645 West 73rd Street, Chicago, Illinois), or equivalent may be used.

c. Bond a strip of Royalite over the crack on the inside of the part for added support. This strip can be somewhat thinner than the original material. The edges of the strip should be chamfered to fair in smoothly with the adjacent area.

d. Using clamps or other suitable means, hold the Royalite strip in place until the adhesive is dry (approximately one hour).

e. Remove all foreign matter from the crack on the outside of the part. Form the crack into a V-shaped groove and fill with adhesive. If a commercial Royalite adhesive is used, some sanding surfacer will be required to aid in filling the groove.

f. Clean, sand smooth, and repaint the repaired area when it is thoroughly dry.

VOLTAGE REGULATOR

(M-1285 and after, MA-364 and after, MB-481 and after, MC-2 and after)

The solid state voltage regulator serves to maintain the output voltage of the alternator at the correct value, instantly compensating for changes in electrical load or engine speed. This regulator employs a DC control principle whereby the field current of the alternator is a steady value which varies only as needed in response to electrical load or engine speed changes.

Employing the DC control principle results in elimination of electrical transients generated in the alternator field by

earlier regulators which employed on-off switching. The elimination of these transients results in improved reliability and eliminates a source of interference which may otherwise enter the radio navigation and communication circuits.

ADJUSTMENT

Regulator voltage adjustment should be changed only while observing the alternator output voltage with an accurate voltmeter connected to the DC bus. Adjustment of the voltage may be accomplished by inserting a small screwdriver in the regulator adjustment hole. This hole is surrounded by a rotation arrow showing the direction for increased voltage. The correct voltage adjustment range is 14.4 ± 1 volts.

NOTE

Whenever removing or replacing a regulator or when changing or adjusting the alternator, the aircraft Battery Master Switch must be in the "OFF" position.

TROUBLESHOOTING

ALTERNATOR AND FULL TRANSISTOR REGULATOR SYSTEM

COMPONENT FAILURE	*SYSTEM EFFECT*	*PROBABLE CAUSE*
1. Output transistor shorted.	a. High system voltage. b. Battery overcharge. c. Lights burning out.	a. F terminal of alternator has been grounded. b. Poor ground in system or poor connection at alternator or regulator. c. Regulator too hot. d. Ground in wiring between F terminals of alternator and regulator. e. Defective transistor. f. Shorted field in alternator.
2. Output transistor open emitter.	a. No charge.	a. Severe ground at F terminal at alternator. b. Severe ground in wiring between F terminals of alternator and regulator. c. Alternator field completely shorted.
3. Driver transistor shorted	a. No charge.	a. Reverse battery polarity. b. High positive transient from an external source. c. Defective transistor.
4. Driver transistor open.	a. High system voltage.	a. Defective transistor.
5. Zener diode shorted.	a. No charge.	a. Reverse battery polarity. b. High system voltage. c. Defective Zener.
6. Zener diode open.	a. High system voltage.	a. Defective Zener.
7. Field discharge.	a. Shorted output transistor and high system voltage.	a. Reverse battery polarity. b. Defective diode.
8. Back bias diode open.	a. No charge.	a. Severe ground at F terminal of alternator. b. Severe ground in wiring between F terminals of alternator and regulator. c. Alternator field completely shorted. d. Defective diode.

ALTERNATOR AND FULL TRANSISTOR REGULATOR SYSTEM (Cont'd)

COMPONENT FAILURE	*SYSTEM EFFECT*	*PROBABLE CAUSE*
9. Back bias diode shorted.	a. Poor switching which would cause shorted output transistor.	a. F terminal of alternator has been grounded b. Poor ground in system or poor connection at alternator or regulator. c. Regulator too hot. d. Ground in wiring between F terminals of alternator and regulator. e. Defective transistor f. Shorted field in alternator. g. Defective diode.
10. Transient suppression diode open.	a. Output transistor may short from transients - depends on application.	a. Reverse battery polarity. b. High positive transient from external source.
11. Filter capacitor open.	a. Poor switching may or may not fail output transistor.	a. Defective connection. b. Defective capacitor.
12. Feedback capacitor shorted.	a. High system voltage.	a. Defective capacitor.
13. Feedback capacitor.	a. Poor switching which could cause shorted output transistor.	a. Poor connection. b. Defective capacitor.
14. Open resistor in negative side of voltage divider. Open negative side of potentiometer.	a. High system voltage.	a. Defective resistor or potentiometer.
15. Open resistor in positive side of voltage divider. Open positive side of potentiometer.	a. No charge.	a. Defective resistor or potentiometer.
16. Open collector load resistor.	a. No charge.	a. Defective resistor.
17. Open driver emitter-base resistor.	a. Poor switching will short output transistor. b. High system voltage.	a. Defective resistor.

BENDIX FUEL INJECTION SYSTEM

TROUBLE	*PROBABLE CAUSE*	*CORRECTION*
1. Hard starting.	a. Technique.	a. Refer to starting procedure in Owner's Manual.
	b. Flooded.	b. Clear engine by cranking with throttle open and mixture in IDLE-CUT-OFF.
	c. Throttle valve opened too far.	c. Open throttle to position approximating 800 rpm.
2. Rough idle.	a. Mixture too rich or too lean.	a. Confirm with mixture control. A too rich mixture will be corrected and roughness decreased during lean-out while a too lean mixture will be aggravated and roughness increased. Adjust idle to give a 25-50 rpm rise @ 700 rpm.
	b. Plugged nozzle(s), flow divider or flow divider lines.	b. Clean nozzles, flow divider or flow divider lines.
	c. Slight air leak into induction system through manifold drain check valve (if installed). Usually able to adjust initial idle but rough in 1000 to 1500 rpm range.	c. Confirm by temporarily plugging drain line. Replace check valves as necessary.
	d. Slight air leak into induction system through loose intake pipe or damaged "O" rings (Usually able to adjust initial idle but rough in 1000 to 1500 rpm range.)	d. Repair as necessary.
	e. Large air leak into induction system. Several cases of 1/8 inch pipe plugs dropping out. (Usually unable to throttle engine down below 800 to 900 rpm.)	e. Repair as necessary.
	f. Internal leak in injector. (Usually unable to lean-out idle range.)	f. Replace injector.

BENDIX FUEL INJECTION SYSTEM (Cont'd)

TROUBLE	*PROBABLE CAUSE*	*CORRECTION*
	g. Fuel vaporizing in fuel lines or distributor. (Encountered only under high ambient temperature conditions or following prolonged operation at low idle rpm's.)	g. Keep nacelle and fuel temperatures as low as possible and make idle speed and mixture adjustment compatible to day time temperature variations.

MAGNETOS

NOTE

Serials MB-540, MB-553 and after, M-1672, M-1673, M-1674, M-1676, M-1677, M-1678, M-1679, M-1682, M-1684, M-1686, M-1687, M-1688, M-1693, M-1698, M-1702, M-1703, M-1705 and after utilize Slick 4000 series sealed, non-serviceable magnetos. It is recommended this magneto be run to a major engine overhaul and then exchanged for a factory rebuilt unit. The timing of the magneto to the engine should be checked every 200 hours.

TROUBLE	*PROBABLE CAUSE*	*CORRECTION*
1. Hard starting.	a. Low voltage at vibrator input.	a. Measure voltage between vibrator terminal marked "in" and the ground terminal while operating starter. A reading of at least 13 volts must be obtained.

NOTE

Steps 1. a., b. and d. apply only to serials M-1 through M-903 which are equipped with an ignition vibrator.

	b. Inoperative or defective vibrator.	b. If voltage is adequate, listen for buzzing of vibrator during starting. If no buzzing is heard, either the vibrator is defective or the circuit from the "Output" terminal on the vibrator to the retard (dual breaker) magneto is open. Check both "Switch and Retard" circuits. Also check for good electrical ground.
	c. Retard breaker in retard (dual breaker) magneto not operating electrically. Engine may kick back during cranking due to advance timing of ignition.	c. Retard points may not be closing due to wrong adjustment, or may not be electrically connected in the circuit due to a poor connection. Inspect retard points to see if they close. Check for proper contact at the "SWITCH" and "RETARD" terminals of retard (dual breaker) magneto and at the vibrator. Check wiring.

MAGNETOS (Cont'd)

TROUBLE	*PROBABLE CAUSE*	*CORRECTION*
2. Engine roughness.		a. Install new spark plugs.
		b. Check plug leads for continuity and breakdown.
		c. Check magneto breakers (main and retard) for burning or dirt.
3. Magneto rpm check is out of limits.		a. Check magneto-to-engine timing.
		b. Inspect breakers for proper opening.
		c. Check plugs and leads.

4

ELECTRICAL WIRING DIAGRAMS

SECTION IV

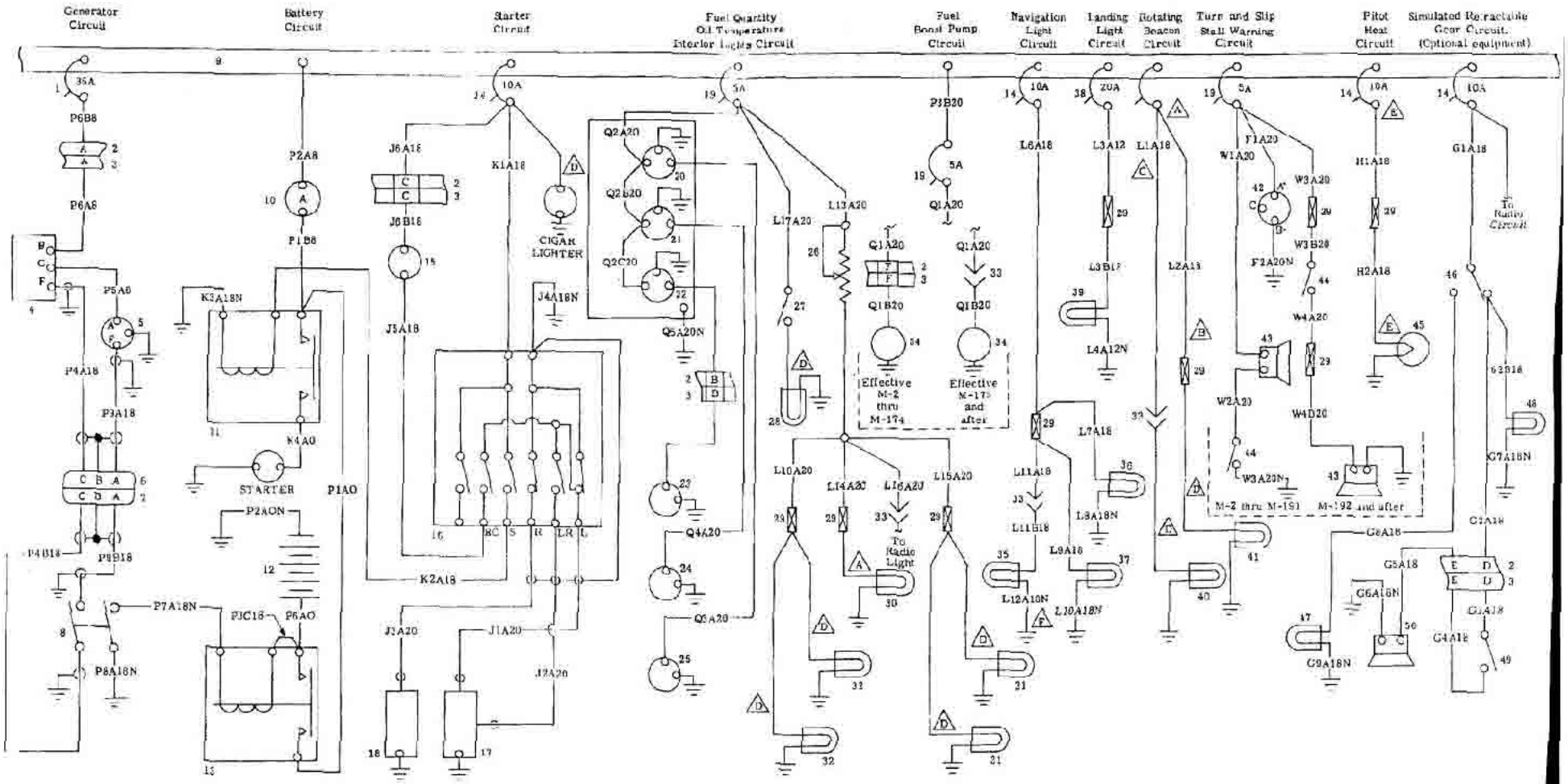
ELECTRICAL WIRING DIAGRAMS

The purpose of these diagrams is to show the electrical components, wiring, and connections of the aircraft in a manner that makes the operation of each circuit easily understandable. The circuits are arranged to help understand their operation and do not indicate the actual physical locations of the components. Each wire is identified by the number it bears in the aircraft. The individual components of each circuit are indexed and identified in the list of components with each diagram, or adjacent to the item itself.

For aircraft serials M-1 through M-554, a general wiring diagram is used. For later aircraft, the individual circuits are shown on separate diagrams. The interrelationships of the various circuits are indicated on the diagrams by a reference to the related circuit. Refer to the Index of Wiring Diagrams on page 4-2 for the page number of the individual circuit diagrams.

ALPHABETICAL INDEX OF WIRING DIAGRAMS

ALPHABETICAL INDEX OF WIRING DIAGRAMS



A M-1 through M-95 - 10 A.
M-100 and after - 15 A.

B M-100 and after - L2A16

C M-100 and after - L1A16

D Wire furnished with purchased equipment and carries no code

E Ends of wires are taped when heated pitot tube is not installed

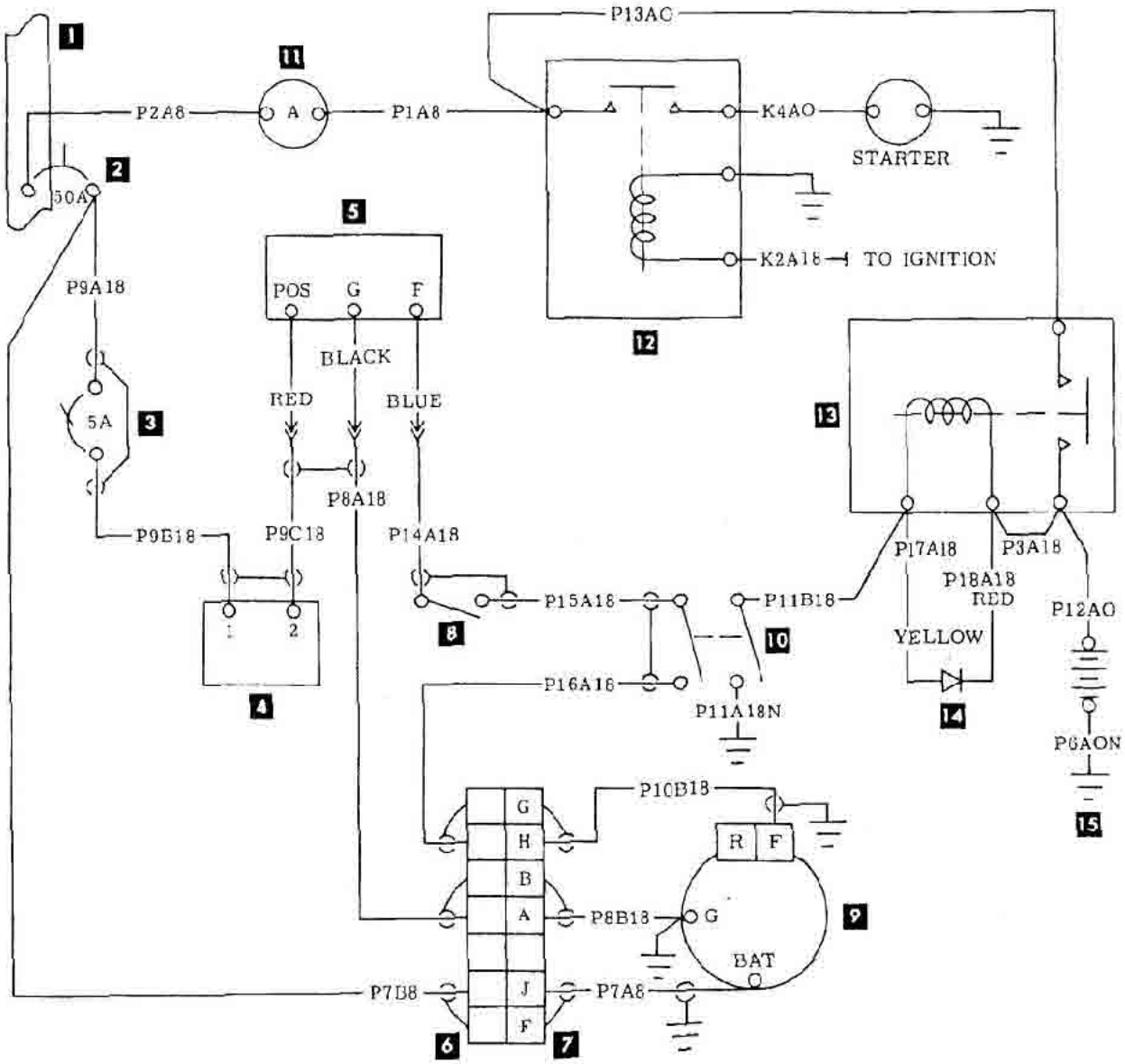
F Ground only on vertical stabilizer structure

General Wiring Diagram
(M-1 thru M-554)

ITEM	NOMENCLATURE	ITEM	NOMENCLATURE
1.	Circuit Breaker (35 Amp)	26.	Dimming Rheostat (25 Watt, 10 Ohm)
2.	Main Firewall Plug	27.	Dome Light Switch
3.	Main Firewall Receptacle	28.	Dome Light
4.	Voltage Regulator	29.	Permanent Splice
5.	Generator	30.	Compass Light
6.	Generator Firewall Receptacle	31.	Instrument Panel Lights
7.	Generator Firewall Plug	32.	Engine Instrument Lights
8.	Master Switch	33.	Disconnect
9.	Main Power Bus	34.	Fuel Boost Pump
10.	Ammeter	35.	Tail Position Light
11.	Starter Relay	36.	Left Position Light
12.	12-Volt Battery	37.	Right Position Light
13.	Battery Relay	38.	Circuit Breaker (20 Amp)
14.	Circuit Breaker (10 Amp)	39.	Landing Light
15.	Starting Vibrator	40.	Lower Rotating Beacon
16.	Ignition Switch	41.	Upper Rotating Beacon
17.	Left Magneto	42.	Turn and Slip Indicator
18.	Right Magneto	43.	Stall Warning Horn
19.	Circuit Breaker (5 Amp)	44.	Stall Detecting Switch
20.	Left Fuel Quantity Gage	45.	Pitot Heater
21.	Right Fuel Quantity Gage	46.	Landing Gear Control Switch
22.	Oil Temperature Gage	47.	Landing Gear Indicator Light (Green)
23.	Oil Temperature Transmitter	48.	Landing Gear Indicator Light (Red)
24.	Right Fuel Quantity Transmitter	49.	Throttle Switch
25.	Left Fuel Quantity Transmitter	50.	Landing Gear Warning Horn

23-369-10

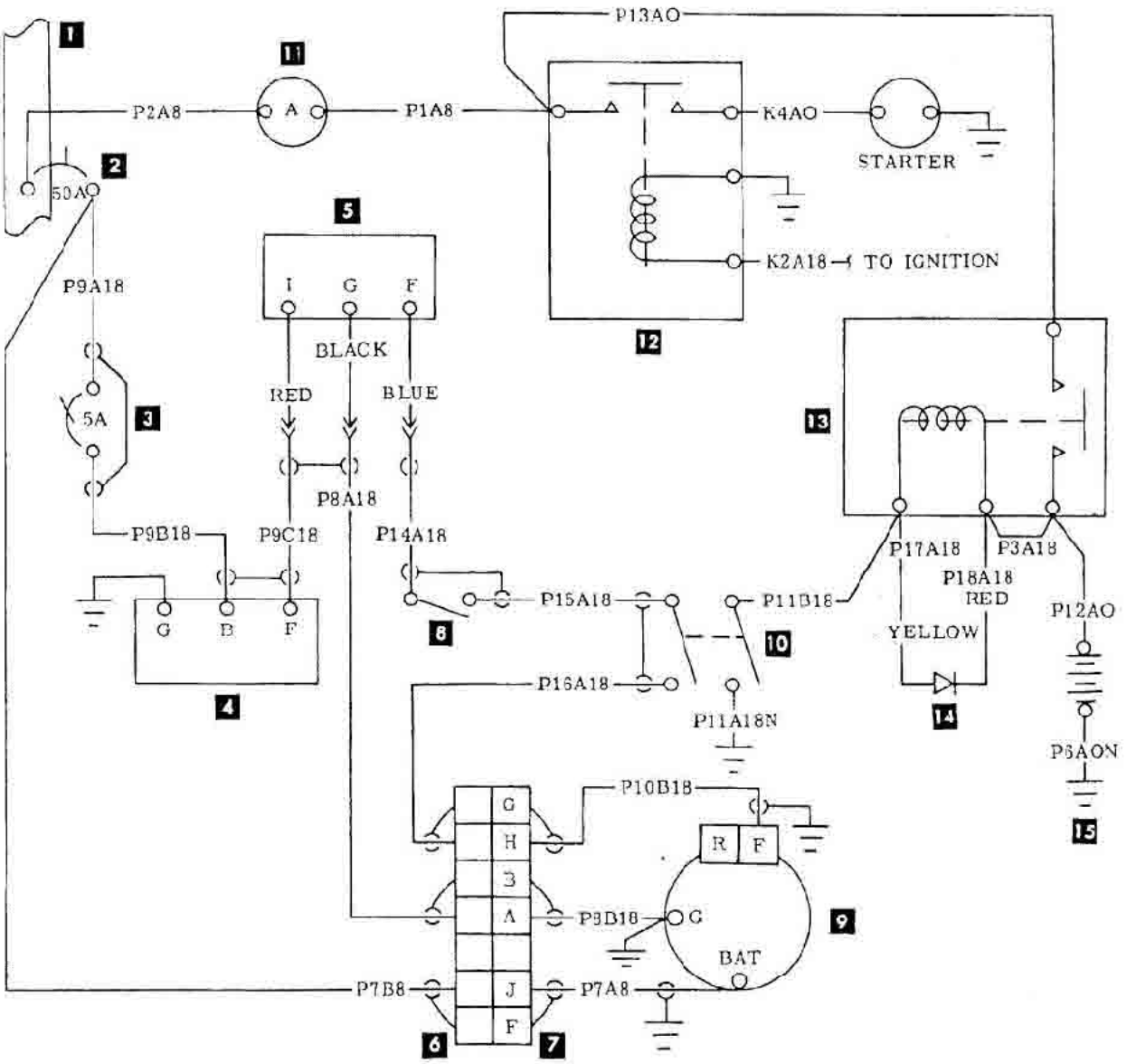
General Wiring Diagram (Index)
(M-1 thru M-554)



1. Bus Bar
2. Circuit Breaker (50 Amp)
3. Circuit Breaker (5 Amp)
4. Overvoltage Relay
5. Voltage Regulator
6. Firewall Receptacle (Large)
7. Firewall Plug (Large)
8. Alternator Switch
9. Alternator
10. Battery Switch
11. Ammeter
12. Starter Relay
13. Battery Relay
14. Klipvolt Polarized Suppressor
15. 12 Volt Battery

23-389-26

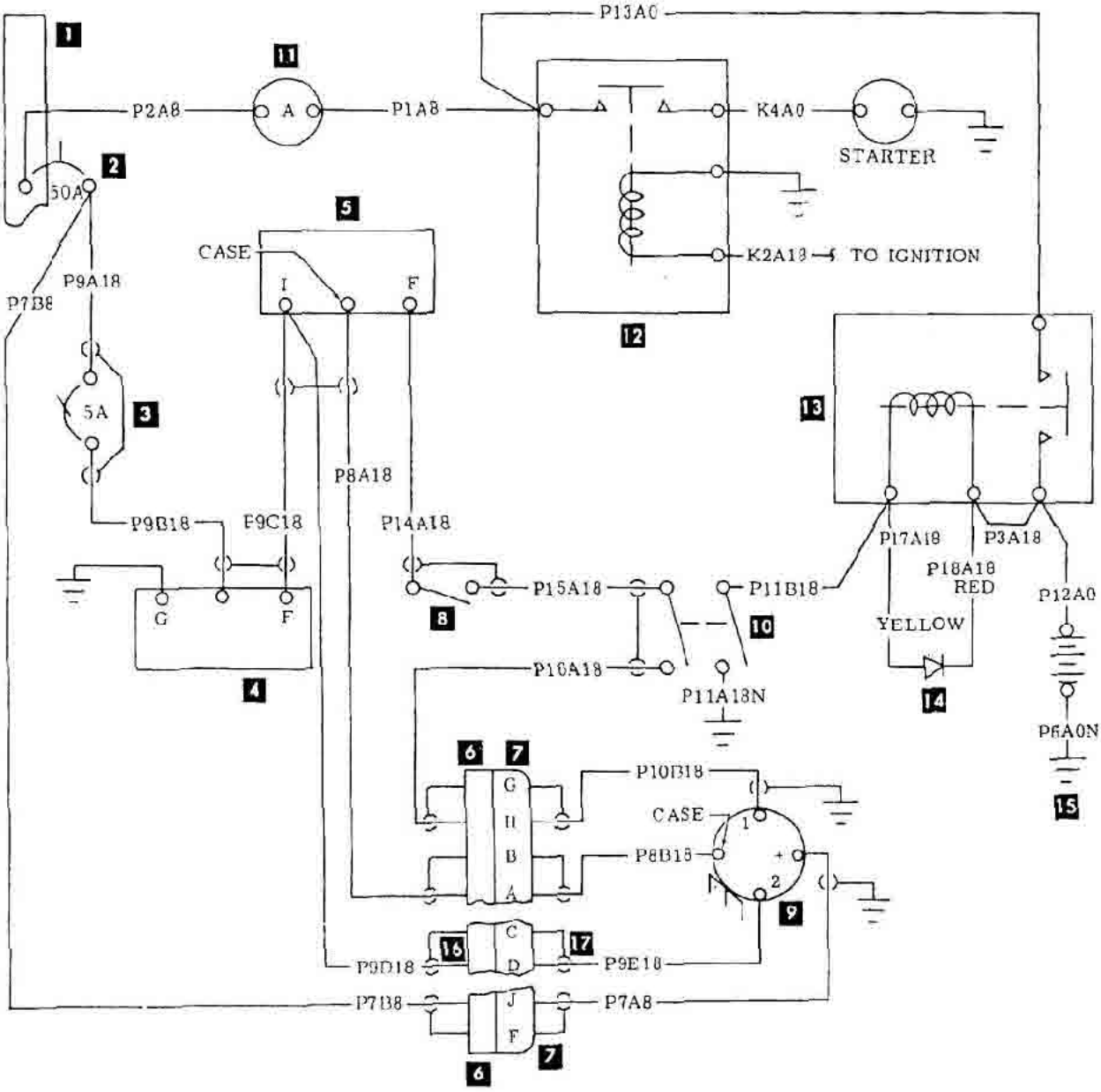
Alternator, Battery and Starter
(M-555 thru M-903)



1. Bus Bar
2. Circuit Breaker (50 Amp)
3. Circuit Breaker (5 Amp)
4. Overvoltage Relay
5. Voltage Regulator
6. Firewall Receptacle (Large)
7. Firewall Plug (Large)
8. Alternator Switch
9. Alternator
10. Battery Switch
11. Ammeter
12. Starter Relay
13. Battery Relay
14. Klipvolt Polarized Suppressor
15. 12 Volt Battery

23.369-27

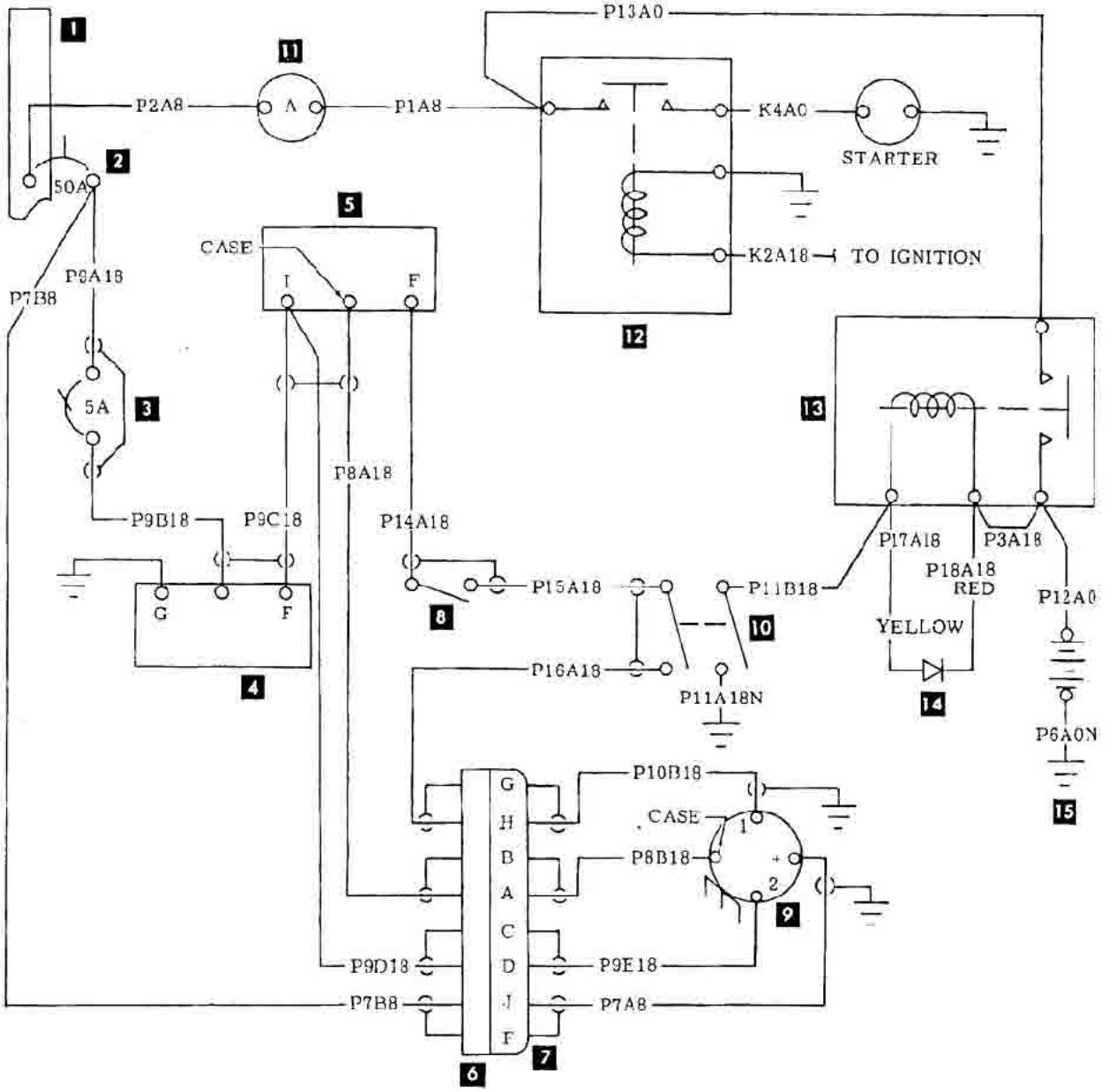
Alternator, Battery and Starter
(M-904 thru M-1139, MA-1 thru MA-332,
MB-1 thru MB-346)



1. Bus Bar
2. Circuit Breaker (50 Amp)
3. Circuit Breaker (5 Amp)
4. Overvoltage Relay
5. Voltage Regulator
6. Firewall Receptacle (Large)
7. Firewall Plug (Large)
8. Alternator Switch
9. Alternator
10. Battery Switch
11. Ammeter
12. Starter Relay
13. Battery Relay
14. Klipvolt Polarized Suppressor
15. 12 Volt Battery
16. Firewall Receptacle (Small)
17. Firewall Plug (Small)

23-369-28

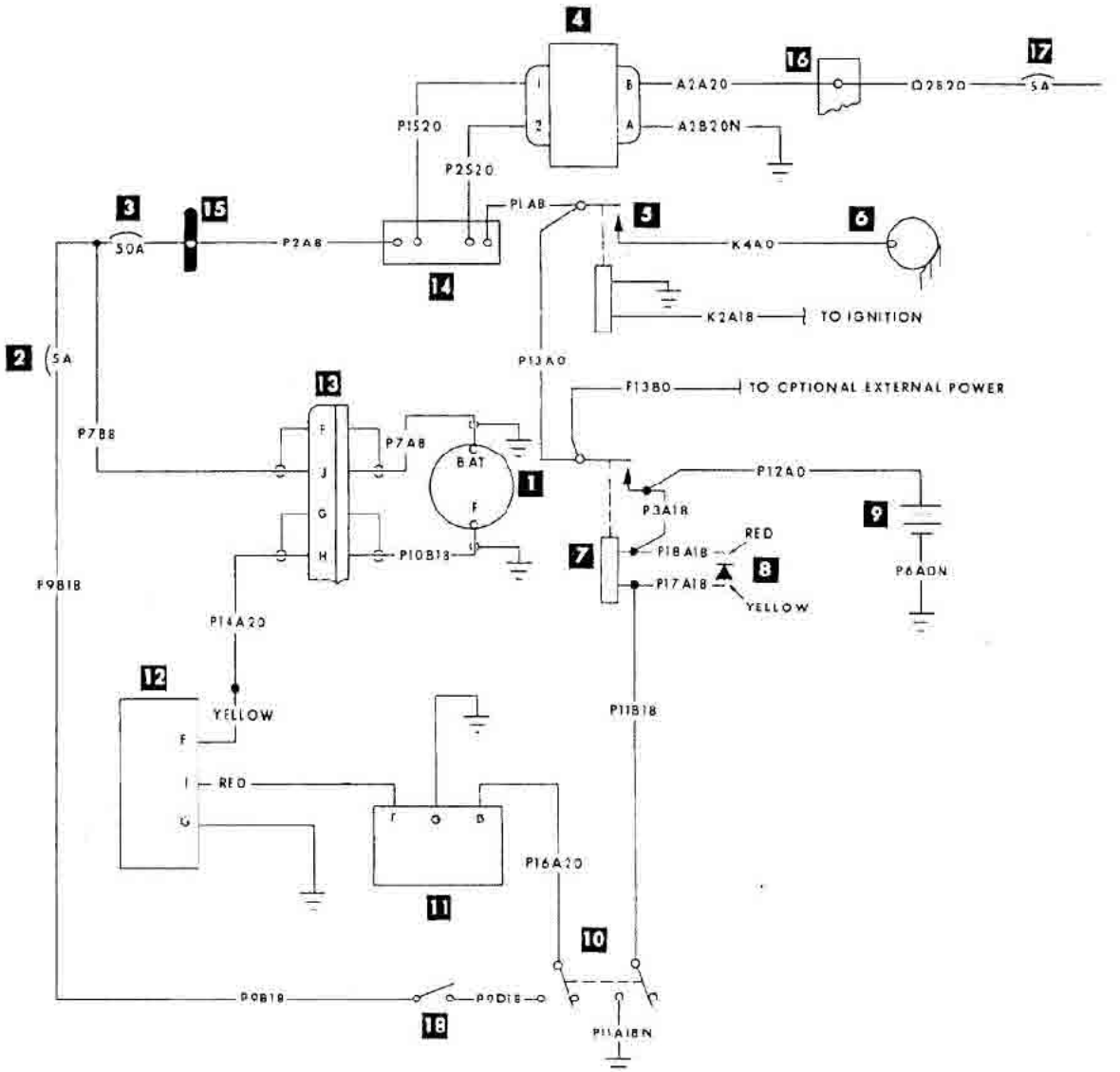
Alternator, Battery and Starter
(M-1140 thru M 1214, MA-333 thru MA-344,
MB-347 thru MB-412)



1. Bus Bar
2. Circuit Breaker (50 Amp)
3. Circuit Breaker (5 Amp)
4. Overvoltage Relay
5. Voltage Regulator
6. Firewall Receptacle (Large)
7. Firewall Plug (Large)
8. Alternator Switch
9. Alternator
10. Battery Switch
11. Ammeter
12. Starter Relay
13. Battery Relay
14. Klipvolt Polarized Suppressor
15. 12 Volt Battery

23-369-19

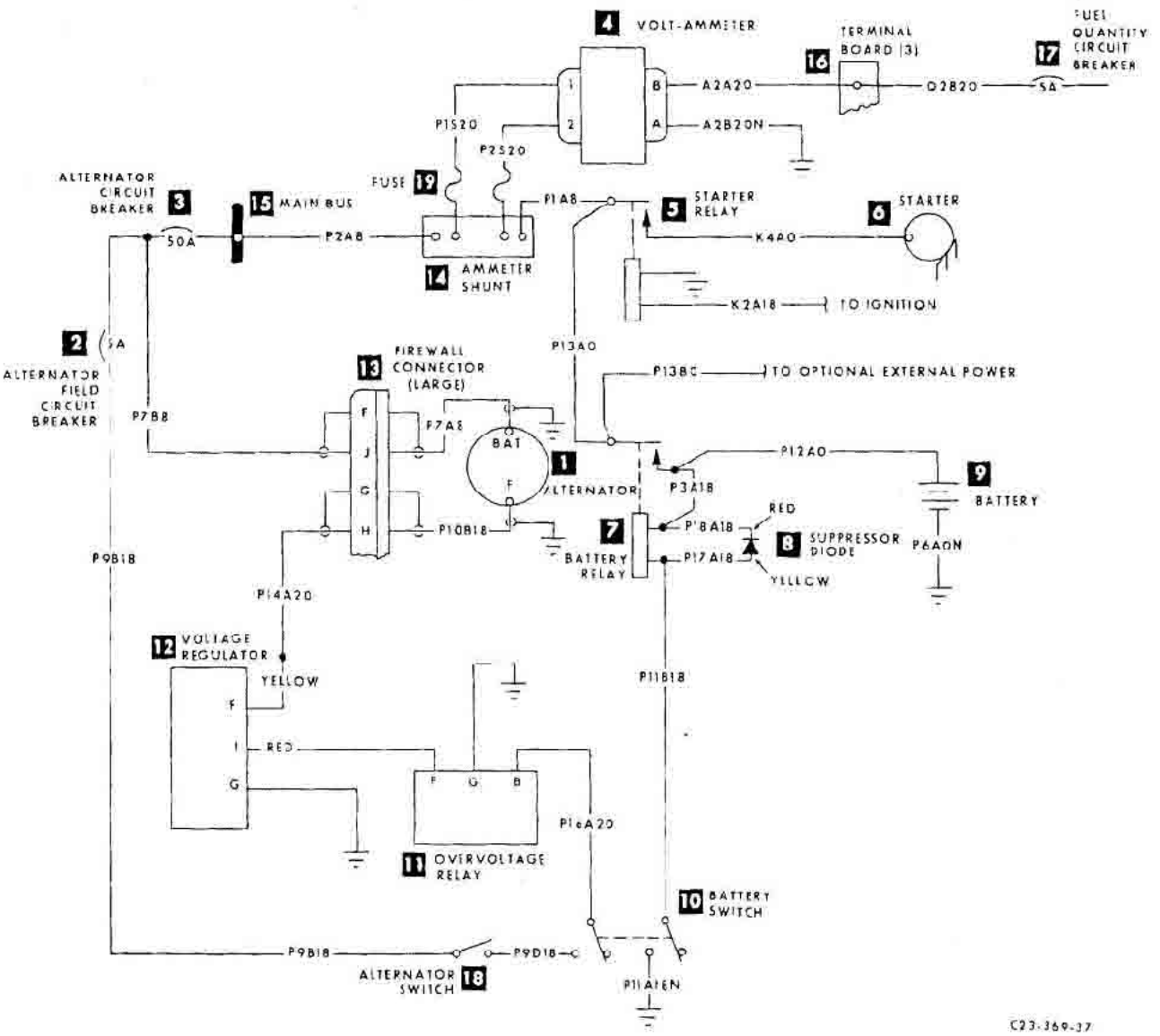
Alternator, Battery and Starter
(M-1215 thru M 1284, MA-345 thru MA-363, MB-413 thru MB-480)



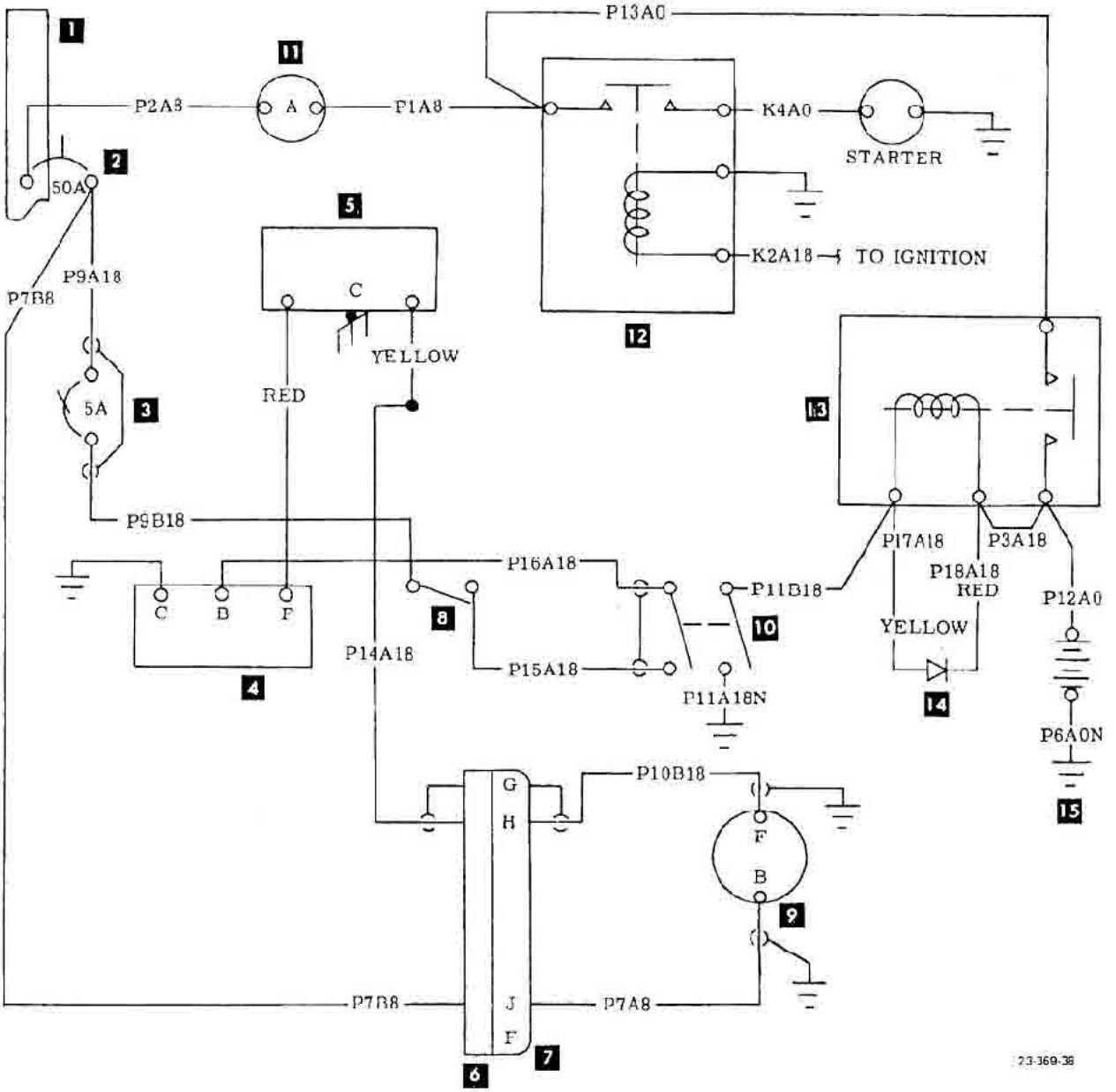
1. Alternator
2. Alternator Field Circuit Breaker
3. Alternator Circuit Breaker
4. Volt-Ammeter
5. Starter Relay
6. Starter
7. Battery Relay
8. Suppressor Diode
9. Battery
10. Battery Switch
11. Overvoltage Relay
12. Voltage Regulator
13. Firewall Connector (Large)
14. Ammeter Shunt
15. Main Bus
16. Terminal Board (3)
17. Fuel Quantity Circuit Breaker
18. Alternator Switch

C23-369-1

Alternator, Battery and Starter
M-1285 thru M-1297
MA-364 thru MA-368
MB-481 thru MB-492
MC-2 thru MC-21, MC-24 thru MC-38, MC-40, MC-41, MC-43 and MC-44

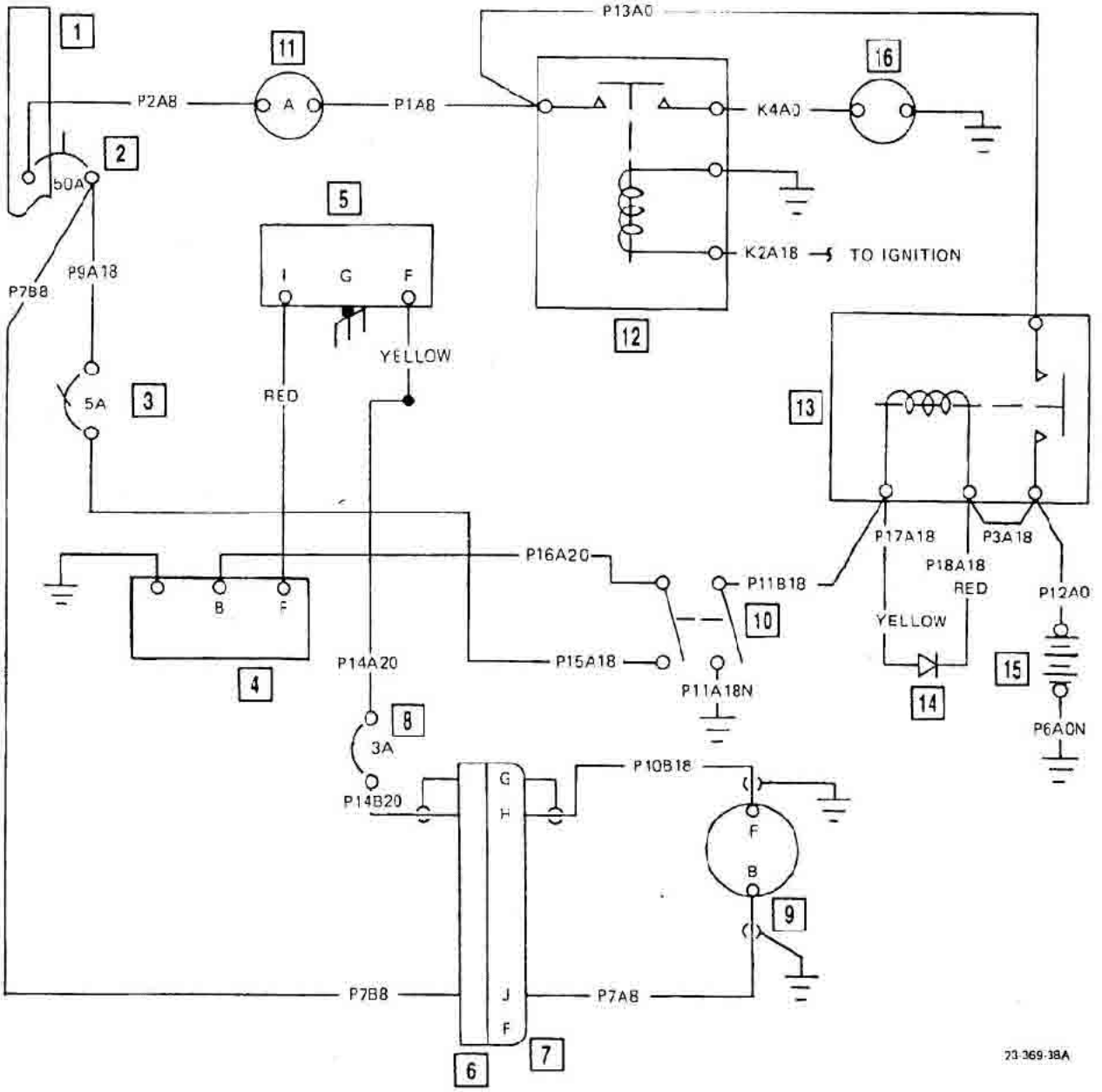


Alternator, Battery and Starter
MC-1298 thru MC-1375
MB-493 thru MB-530
MC-22, MC-23, MC-39, MC-42, MC-45 thru MC-102 and previous aircraft serials complying with S.I. 0402-354



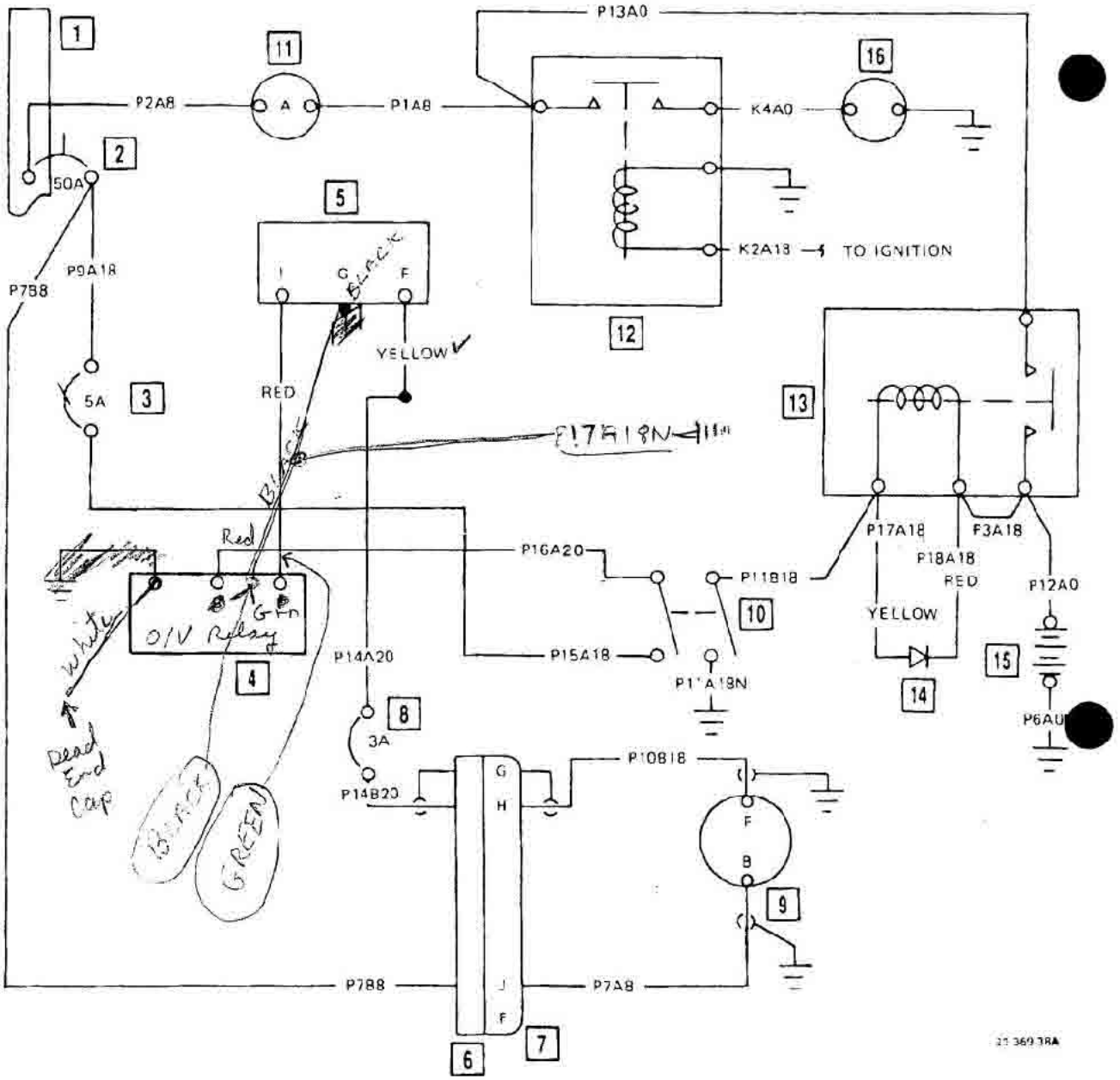
1. Bus Bar
2. Circuit Breaker (50 Amp)
3. Circuit Breaker (5 Amp)
4. Overvoltage Relay
5. Voltage Regulator
6. Firewall Receptacle (Large)
7. Firewall Plug (Large)
8. Alternator Switch
9. Alternator
10. Battery Switch
11. Ammeter
12. Starter Relay
13. Battery Relay
14. Klipvolt Polarized Suppressor
15. 12 Volt Battery

Alternator, Battery and Starter
M-1376 thru M-1505
MB-531 thru MB-634
MC-103 thru MC-210



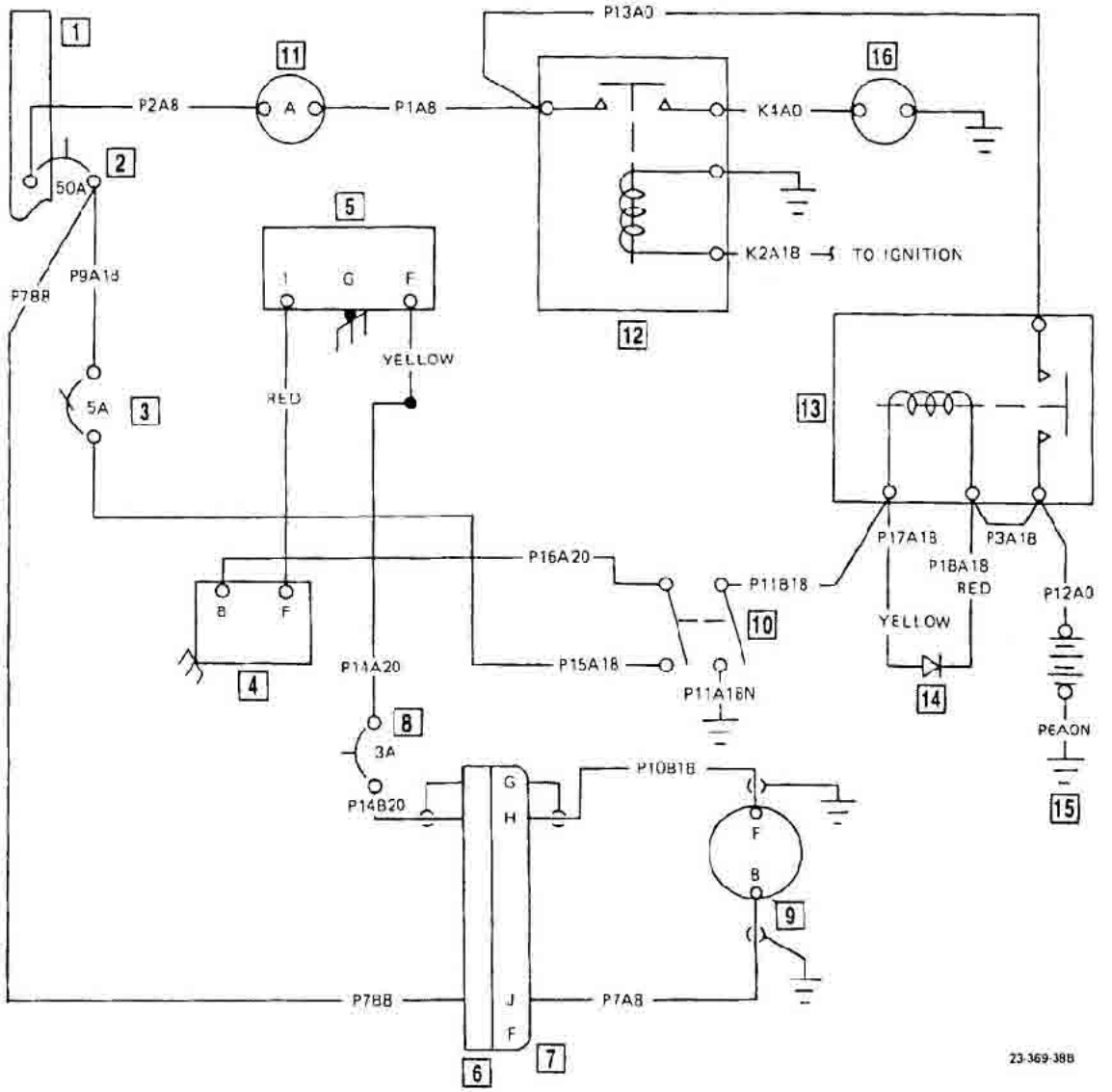
1. Bus Bar
2. Circuit Breaker (50 Amp)
3. Alternator Circuit Breaker Switch (5 Amp)
4. Overvoltage Relay
5. Voltage Regulator
6. Firewall Receptacle (Large)
7. Firewall Plug (Large)
8. Circuit Breaker (3 Amp)
9. Alternator
10. Battery Switch
11. Ammeter
12. Starter Relay
13. Battery Relay
14. Klipvolt Polarized Suppressor
15. 12 Volt Battery
16. Starter

Alternator, Battery and Starter
M-1506 thru M-1644
MB-635 thru MB-769
MC-211 thru MC-346



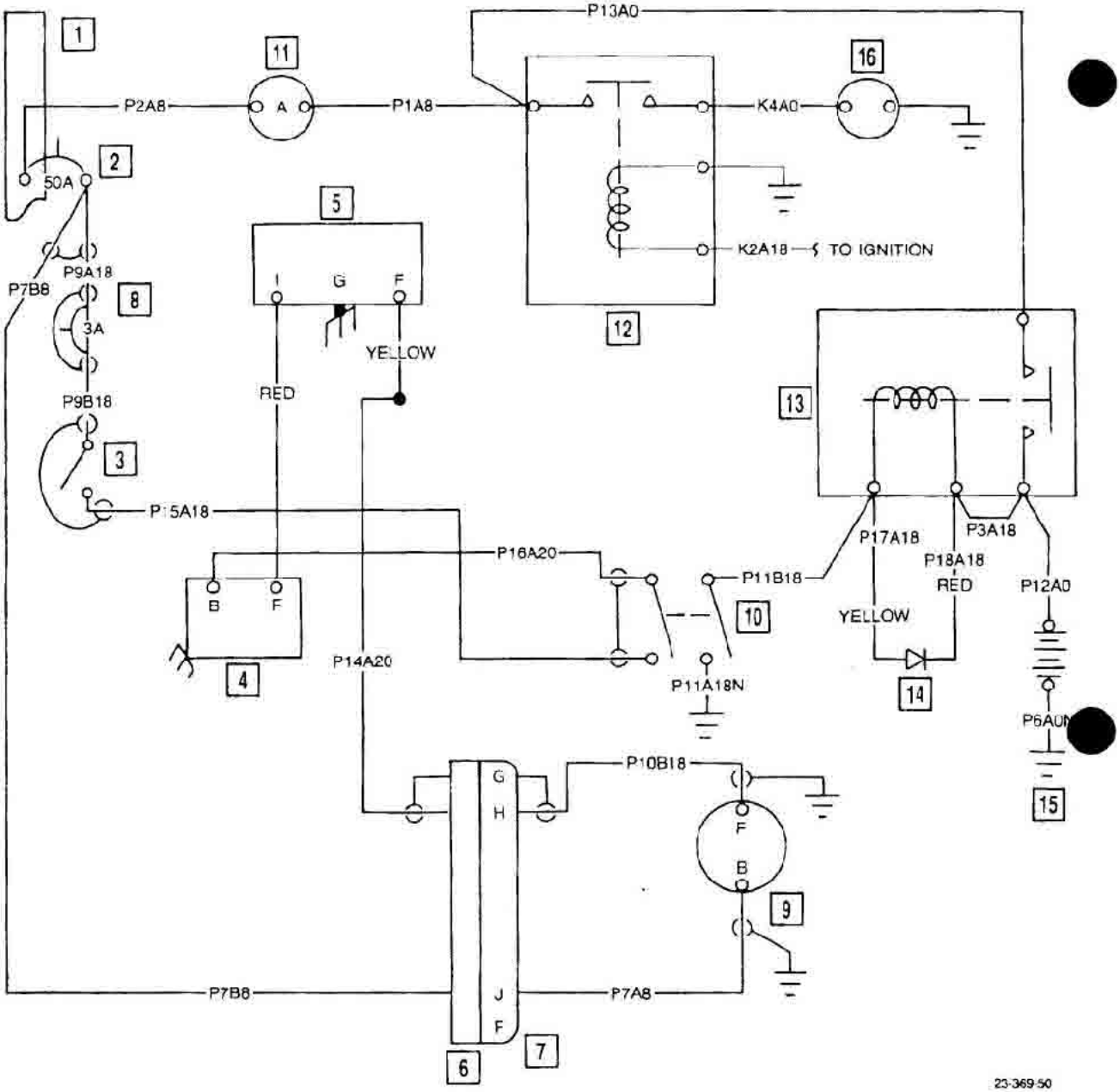
1. Bus Bar
2. Circuit Breaker (50 Amp)
3. Alternator Circuit Breaker Switch (5 Amp)
4. Overvoltage Relay
5. Voltage Regulator
6. Firewall Receptacle (Large)
7. Firewall Plug (Large)
8. Circuit Breaker (3 Amp)
9. Alternator
10. Battery Switch
11. Ammeter
12. Starter Relay
13. Battery Relay
14. Klipvolt Polarized Suppressor
15. 12 Volt Battery
16. Starter

Alternator, Battery and Starter
M-1506 thru M-1644
MB-635 thru MB-769
MC-211 thru MC-345



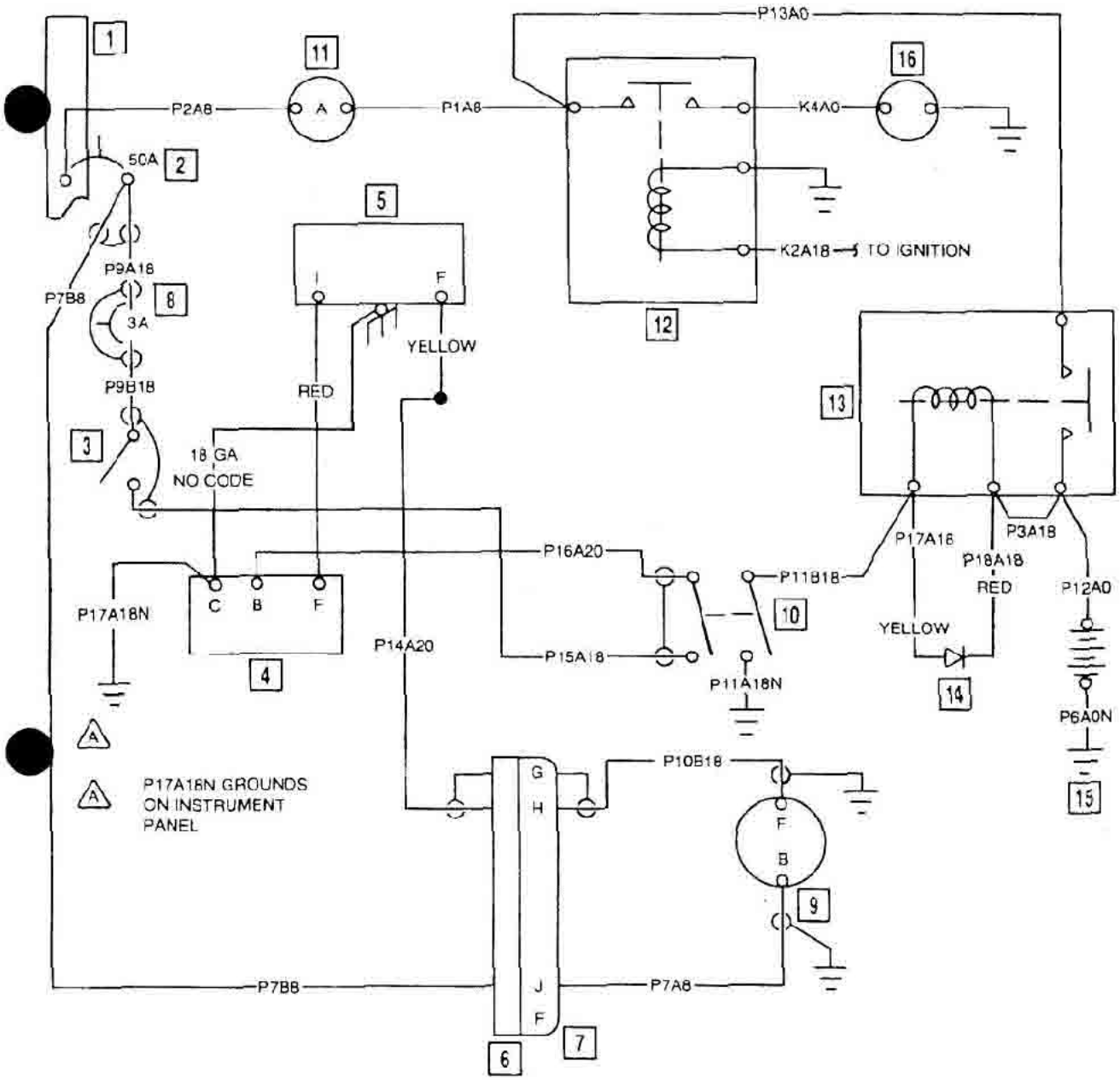
1. Bus Bar
2. Circuit Breaker (50 Amp)
3. Alternator Circuit Breaker Switch (5 Amp)
4. Overvoltage Relay
5. Voltage Regulator
6. Firewall Receptacle (Large)
7. Firewall Plug (Large)
8. Circuit Breaker (3 Amp)
9. Alternator
10. Battery Switch
11. Ammeter
12. Starter Relay
13. Battery Relay
14. Klipvolt Polarized Suppressor
15. 12 Volt Battery
16. Starter

Alternator, Battery and Starter
M-1645 thru M-1838
MB-770 thru MB-799
MC-347 thru MC-424



1. Bus Bar
2. Circuit Breaker (50 Amp)
3. Alternator Switch
4. Overvoltage Relay
5. Voltage Regulator
6. Firewall Receptacle (Large)
7. Firewall Plug (Large)
8. Circuit Breaker (3 Amp)
9. Alternator
10. Battery Switch
11. Ammotor
12. Starter Relay
13. Battery Relay
14. Klipvolt Polarized Suppressor
15. 12 Volt Battery
16. Starter

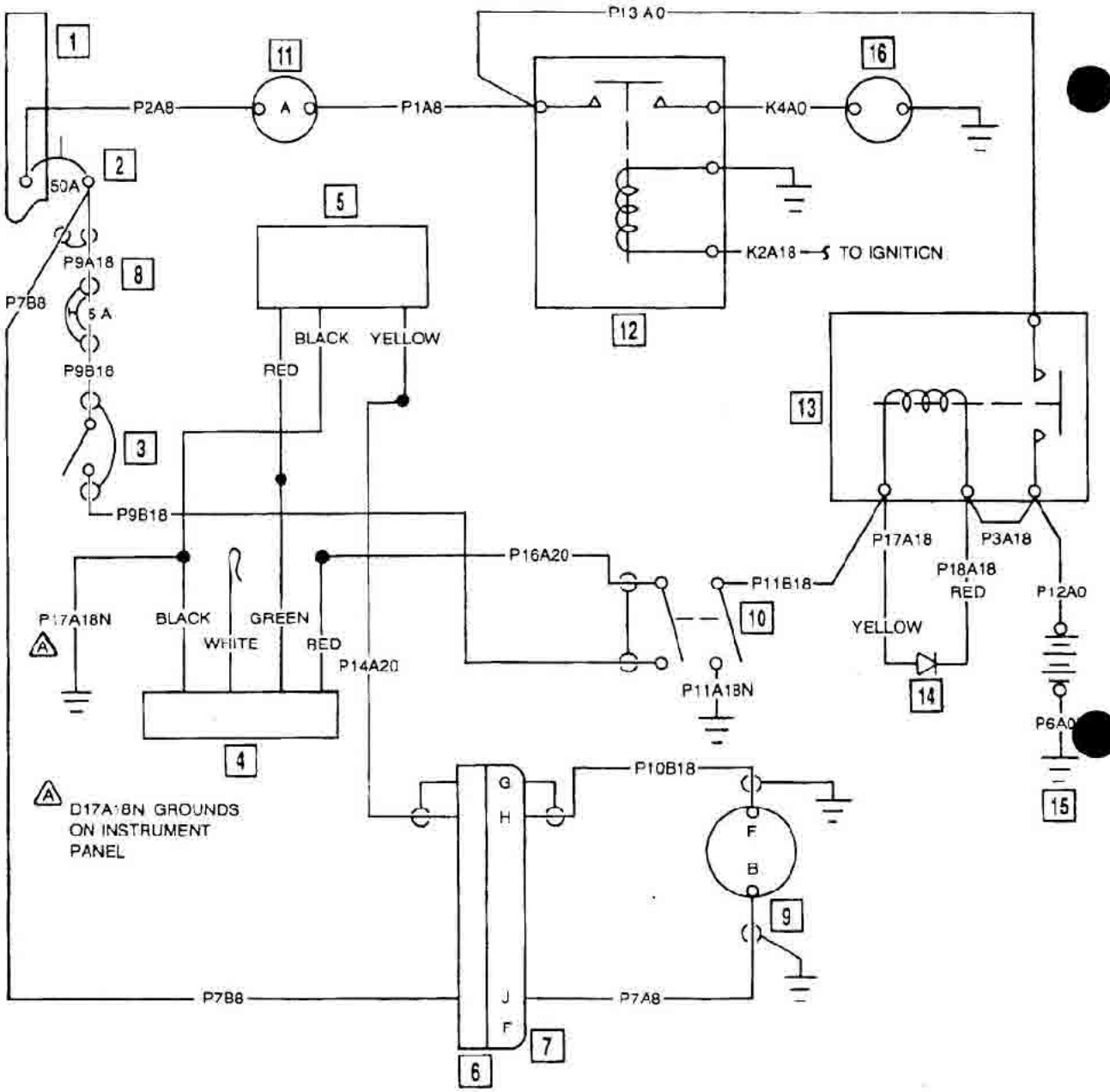
Alternator, Battery and Starter
M-1839 thru M-1890
MB-800 thru MB-821
MC-425 thru MC-459



1. Bus Bar
2. Circuit Breaker (50 Amp)
3. Alternator Switch
4. Overvoltage Relay
5. Voltage Regulator
6. Firewall Receptacle (Large)
7. Firewall Plug (Large)
8. Circuit Breaker (3 Amp)
9. Alternator
10. Battery Switch
11. Ammeter
12. Starter Relay
13. Battery Relay
14. Klipvolt Polarized Suppressor
15. 12 Volt Battery
16. Starter

23-369-51

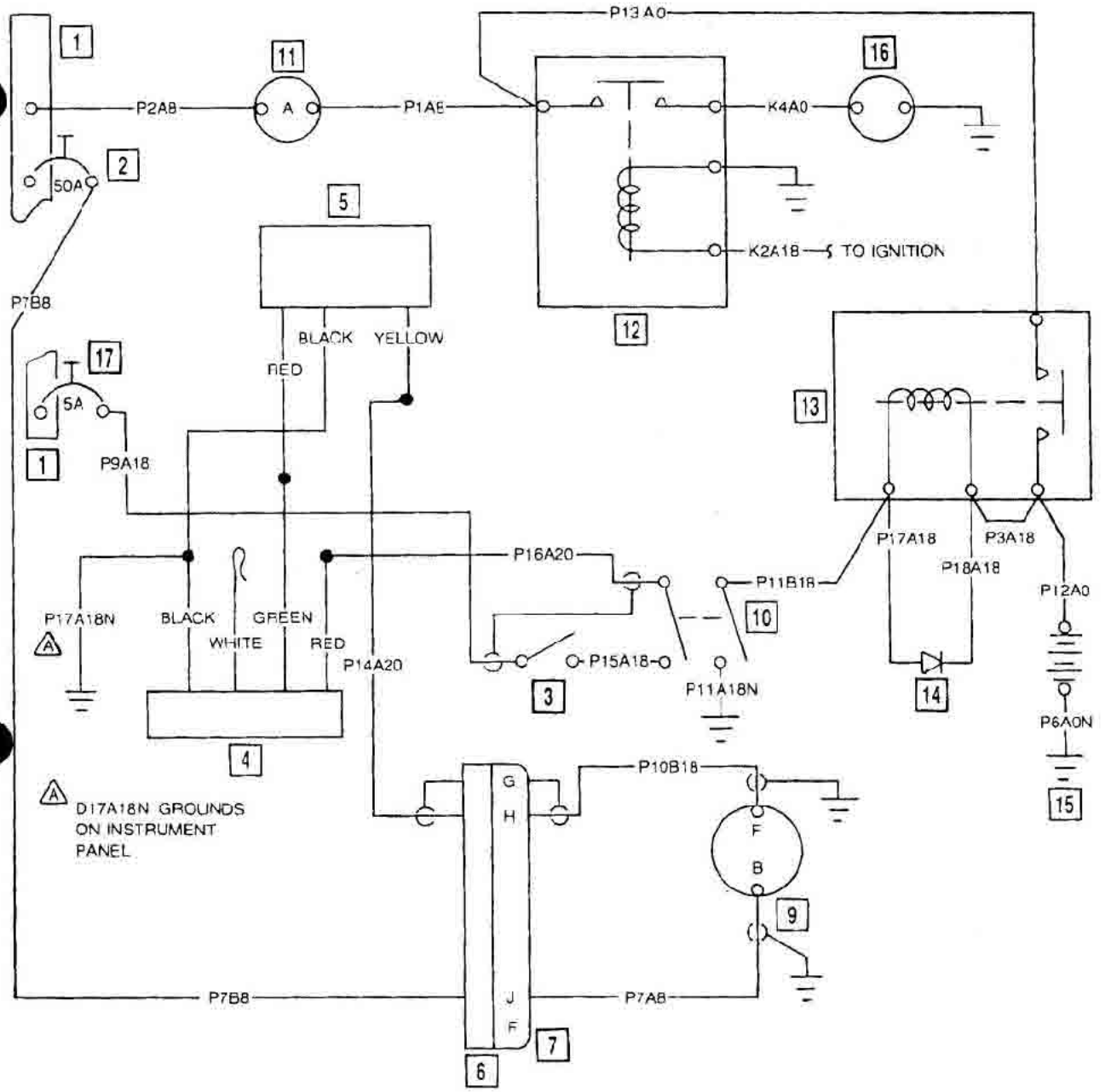
Alternator, Battery and Starter
M-1691 thru M-1929
MB-822 thru MB-840
MC-460 thru MC-487



1. Bus Bar
2. Circuit Breaker (50 Amp)
3. Alternator Switch
4. Overvoltage Relay
5. Voltage Regulator
6. Firewall Receptacle (Large)
7. Firewall Plug (Large)
8. Circuit Breaker (5 Amp)
9. Alternator
10. Battery Switch
11. Ammeter
12. Starter Relay
13. Battery Relay
14. Klipvolt Polarized Suppressor
15. 12 Volt Battery
16. Starter

23-369-52

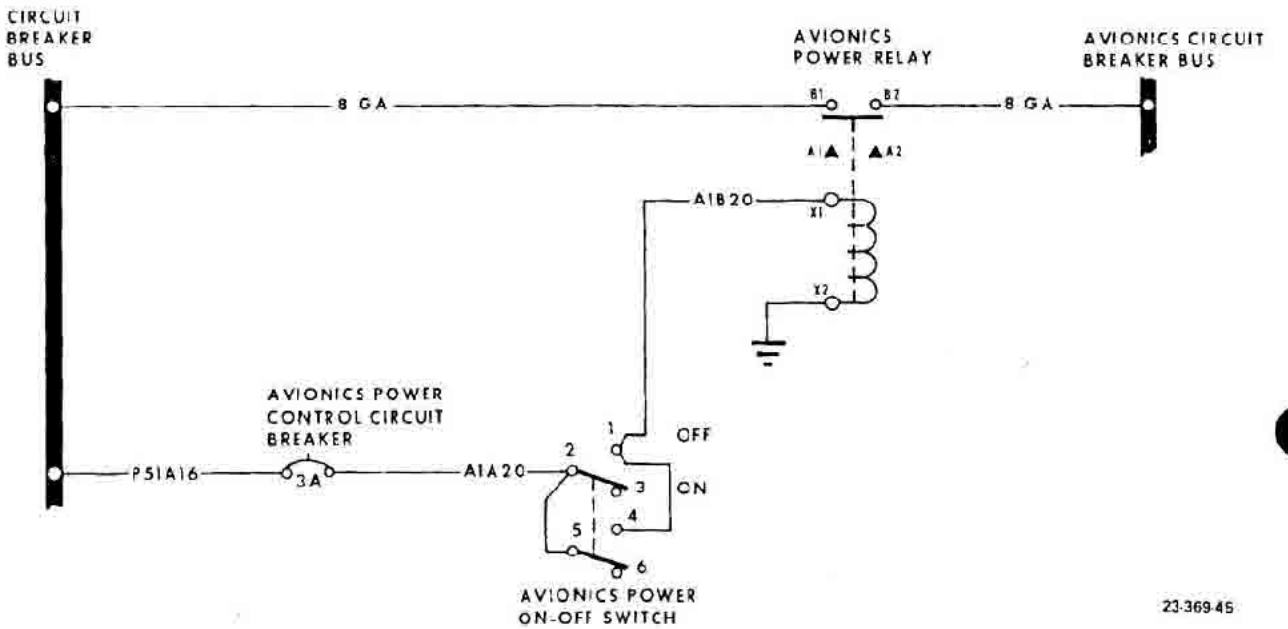
Alternator, Battery and Starter
M-1930 thru M-1970, M-1972 thru M-1979; MB-841 thru MB-865; MC-488 thru MC-532, MC-534 thru MC-536



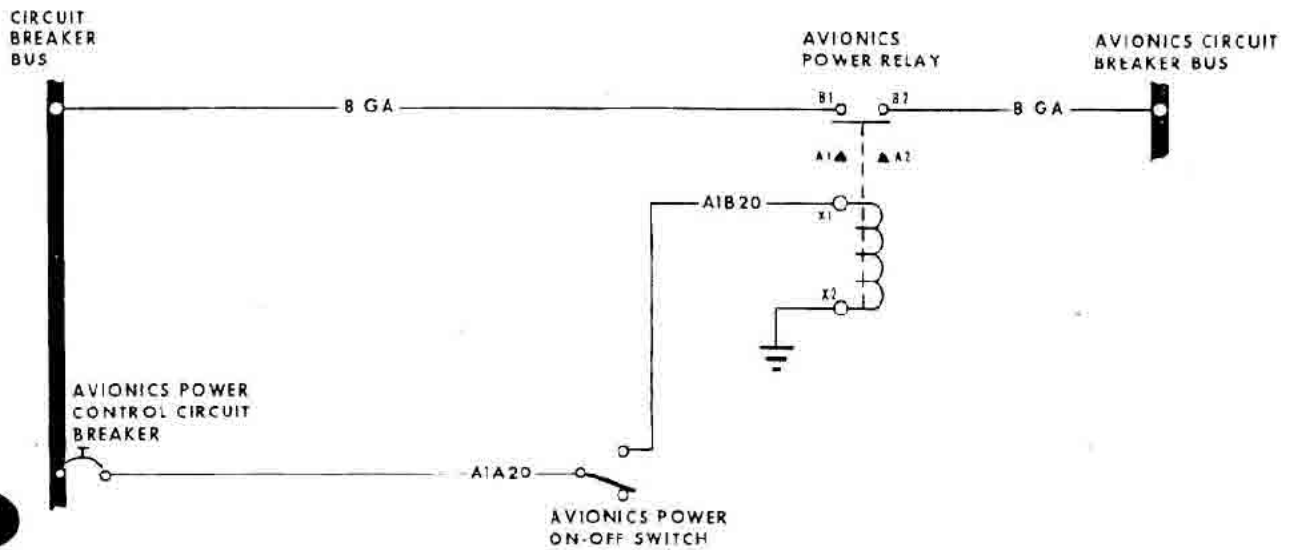
1. Bus Bar
2. Alternator Circuit Breaker (50 AMP)
3. Alternator Switch
4. Overvoltage Relay
5. Voltage Regulator
6. Firewall Receptacle (Large)
7. Firewall Plug (Large)
8. Circuit Breaker (5 Amp)
9. Alternator
10. Battery Switch
11. Ammeter
12. Starter Relay
13. Battery Relay
14. Klipvolt Polarized Suppressor
15. 12 Volt Battery
16. Starter
17. Alternator Field Circuit Breaker (5 AMP)

19-359-54

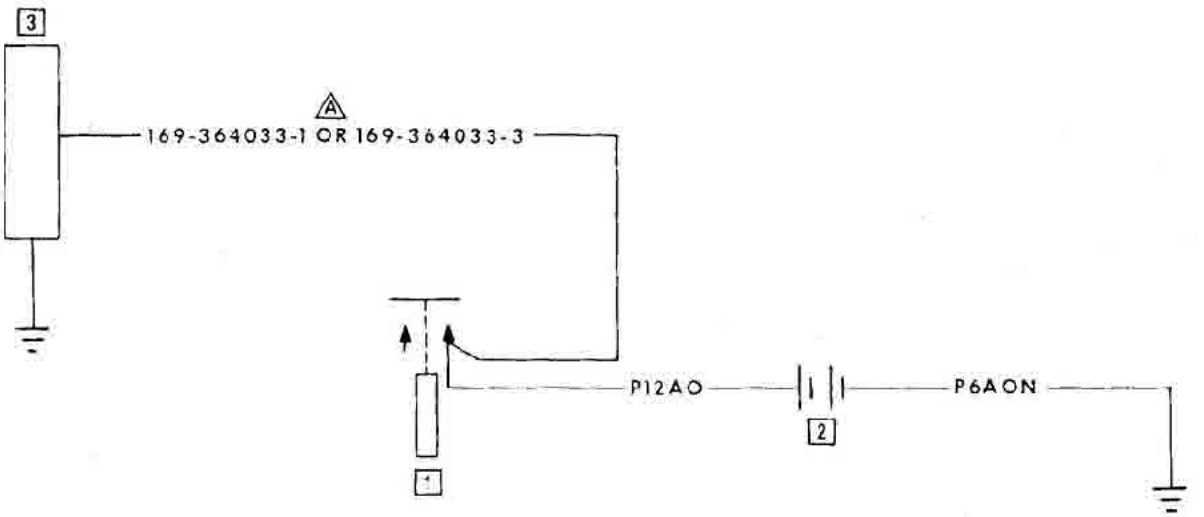
Alternator, Battery and Starter
M-1971, M-1980 and after
MB-866 and after
MC-533, MC-537 and after



Avionics Power (Optional)
M-1474 thru M-1970, M-1972 thru M-1979
MB-585 thru MB-865
MC-151 thru MC-532, MC-534 thru MC-536



Avionics Power (Optional)
M-1971, M-1980 and after
MB-866 and after
MC-533, MC-537 and after

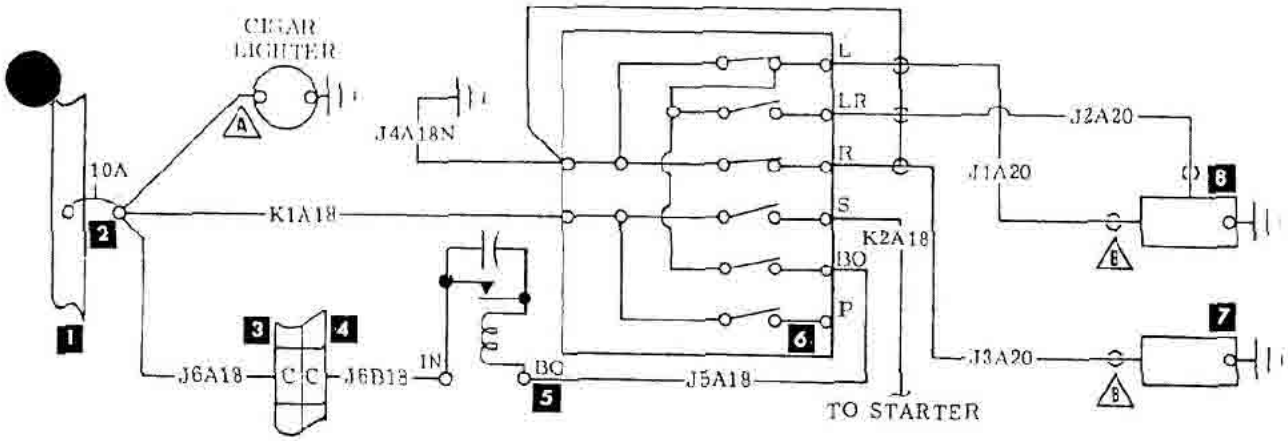


1. Battery Relay
2. Battery
3. External Power Receptacle

A 169-364033-1 Cable used M-1 and after; MA-1 and after; MC-1 and after.
169-364033-3 Cable used MB-1 and after

19-369-57

External Power (Optional)
M-1 and after
MA-1 and after
MB-1 and after
MC-2 and after



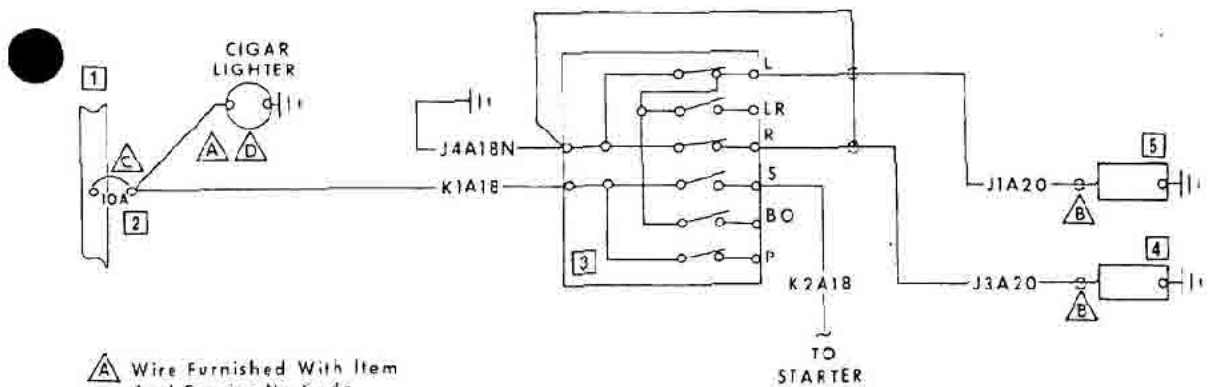
A Wire Furnished With Item And Carries no Code

B Ground Shield of Ignition Leads Inside Magnetos

1. Bus Bar
2. Circuit Breaker (10 amp)
3. Main Firewall Plug
4. Main Firewall Receptacle
5. Starting Vibrator
6. Ignition Switch
7. Right Magneto
8. Left Magneto

23.369.20

Ignition
(M-555 thru M-903)



A Wire Furnished With Item And Carries No Code

B Ground Shield Of Ignition Leads Inside Magnetos

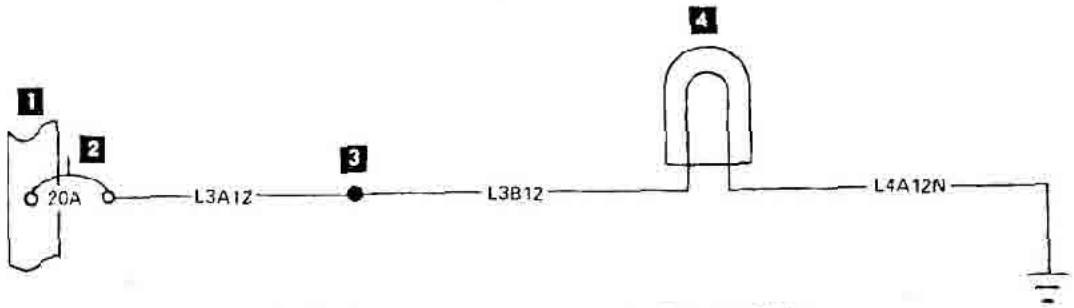
C Circuit Breaker Changed to 7.5 amp at M-1971, M-1980 and after; MB-866 and after; MC-533; MC-537and after.

D Cigar Lighter Removed from Ignition Circuit Breaker at M-1971, M-1980 and after; MB-866 and after; MC-533, MC-537 and after

1. Bus Bar
2. Circuit Breaker (10 amp)
3. Ignition Switch
4. Right Magneto
5. Left Magneto

23.369.29

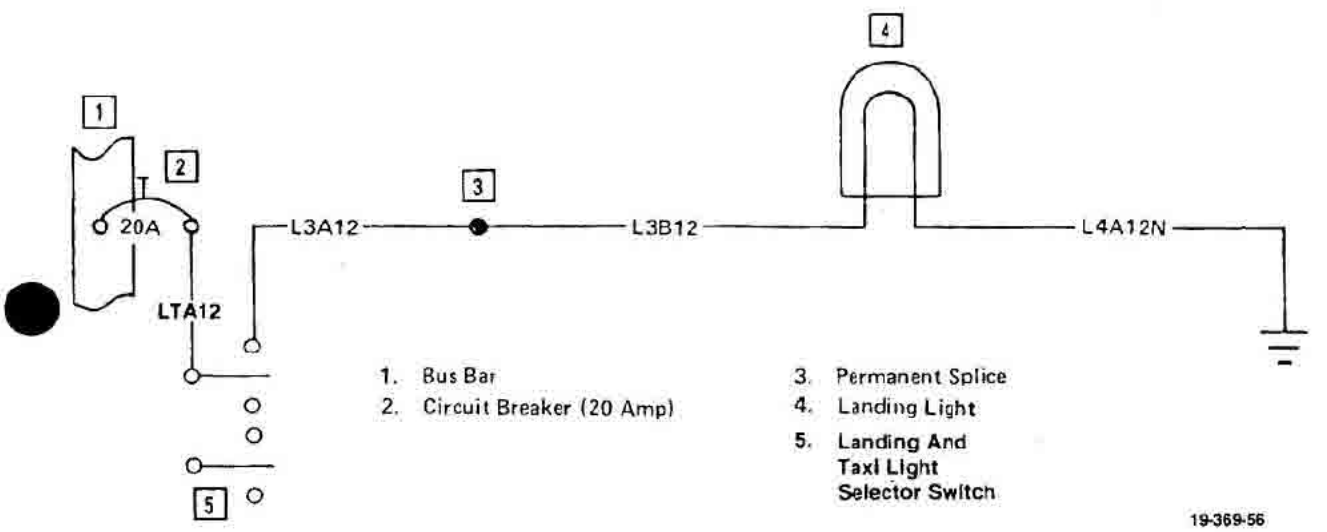
Ignition
(M-904 and after, MA-1 and after
MB-1 and after, MC-2 and after)



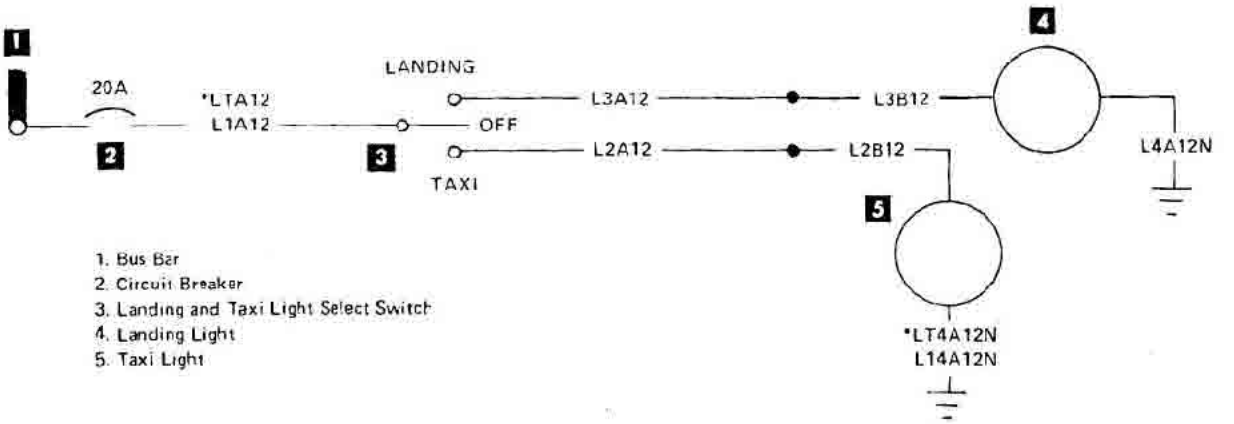
1. Bus Bar
2. Circuit Breaker (20 Amp)
3. Permanent Splice
4. Landing Light

A23-369-3

Landing Light
M-555 thru M-1284
MA-1 thru MA-363
MB-1 thru MB-480



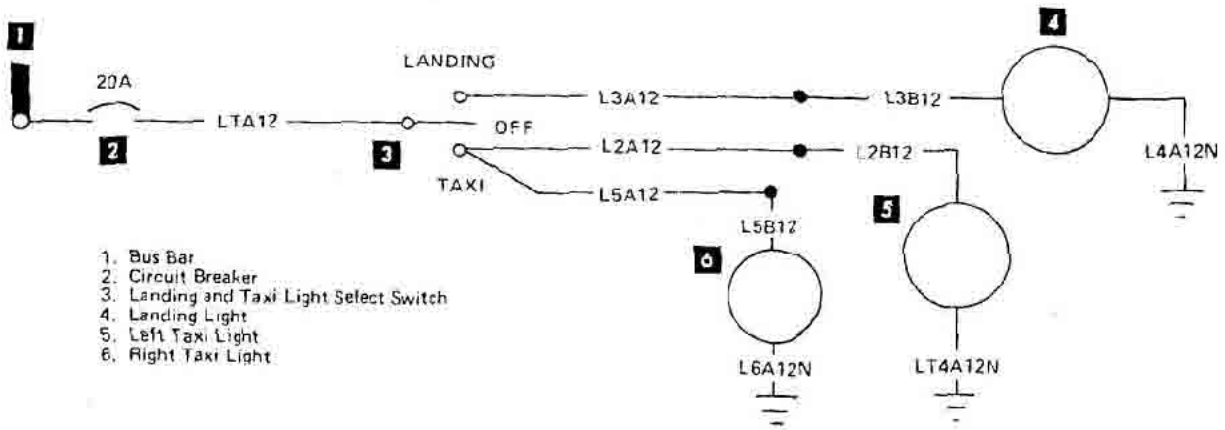
Landing Light (Optional)
M-1971, M-1980 and after
MB-866 and after
MC-533, MC-537 and after



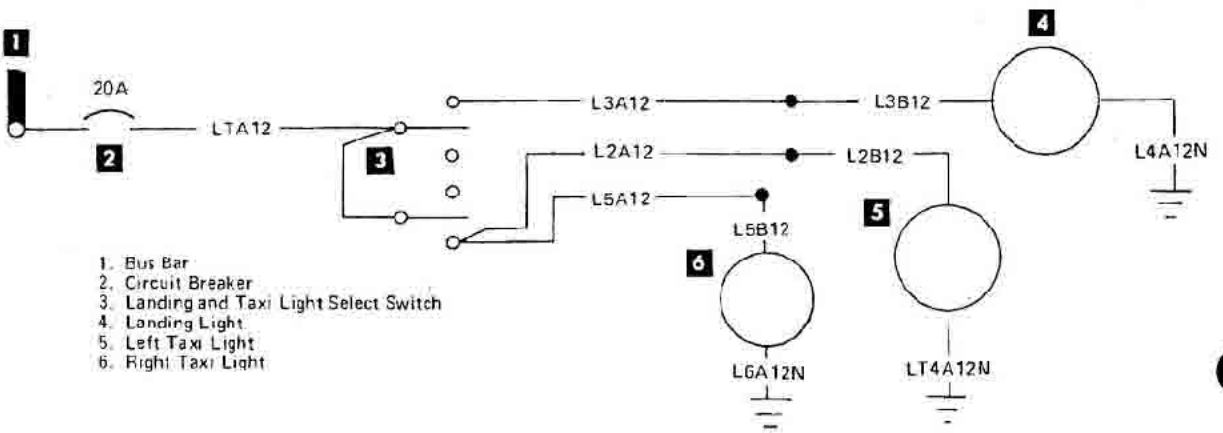
1. Bus Bar
2. Circuit Breaker
3. Landing and Taxi Light Select Switch
4. Landing Light
5. Taxi Light

C23-369-30A

Landing and Taxi Light
M-1285 thru MA-1490
MA-364 thru MA-368
MB-481 thru MB-621
MC-2 thru MC-190



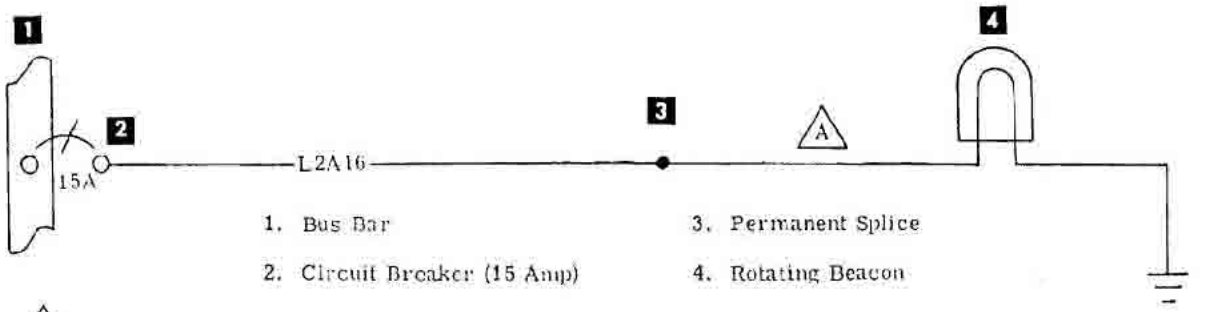
Landing and Taxi Light
M-1491 thru M-1970, M-1972 thru M-1979
MB-622 thru MB-865
MC-191 thru MC-532, MC-534 thru MC-536



1. Bus Bar
2. Circuit Breaker
3. Landing and Taxi Light Select Switch
4. Landing Light
5. Left Taxi Light
6. Right Taxi Light

19-369-55

Landing and Taxi Light (Optional)
M-1971, M-1980 and after
MB-866 and after
MC-533, MC-537 and after

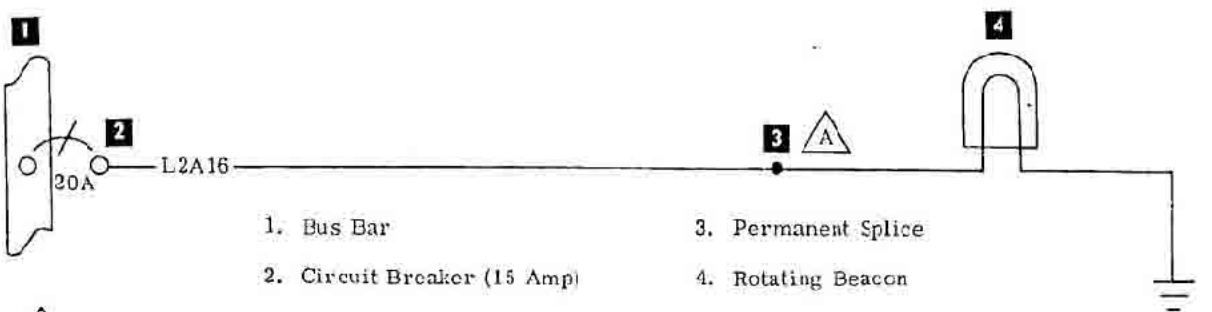


1. Bus Bar
2. Circuit Breaker (15 Amp)
3. Permanent Splice
4. Rotating Beacon

A Wire Furnished With Item And Carries No Code

C23-369-5

Rotating Beacon
(M-555 thru M-1284, MA-1 thru MA-363, MB-1 thru MB-480)

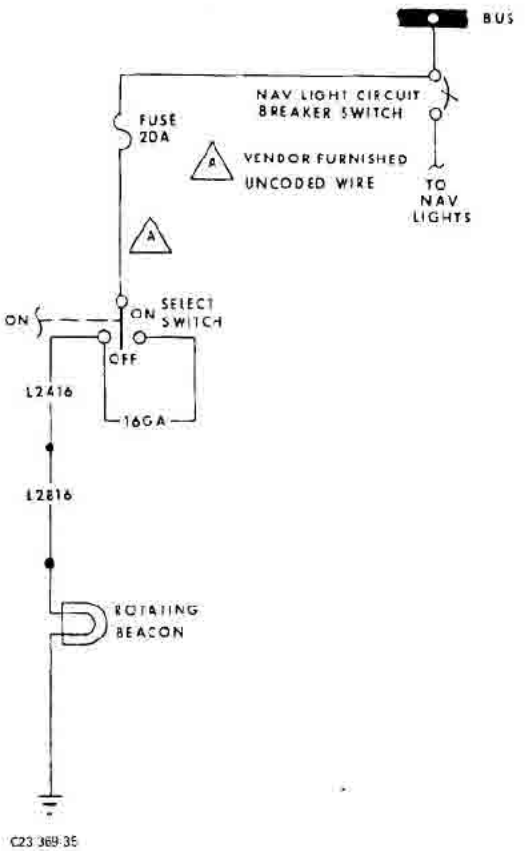


1. Bus Bar
2. Circuit Breaker (15 Amp)
3. Permanent Splice
4. Rotating Beacon

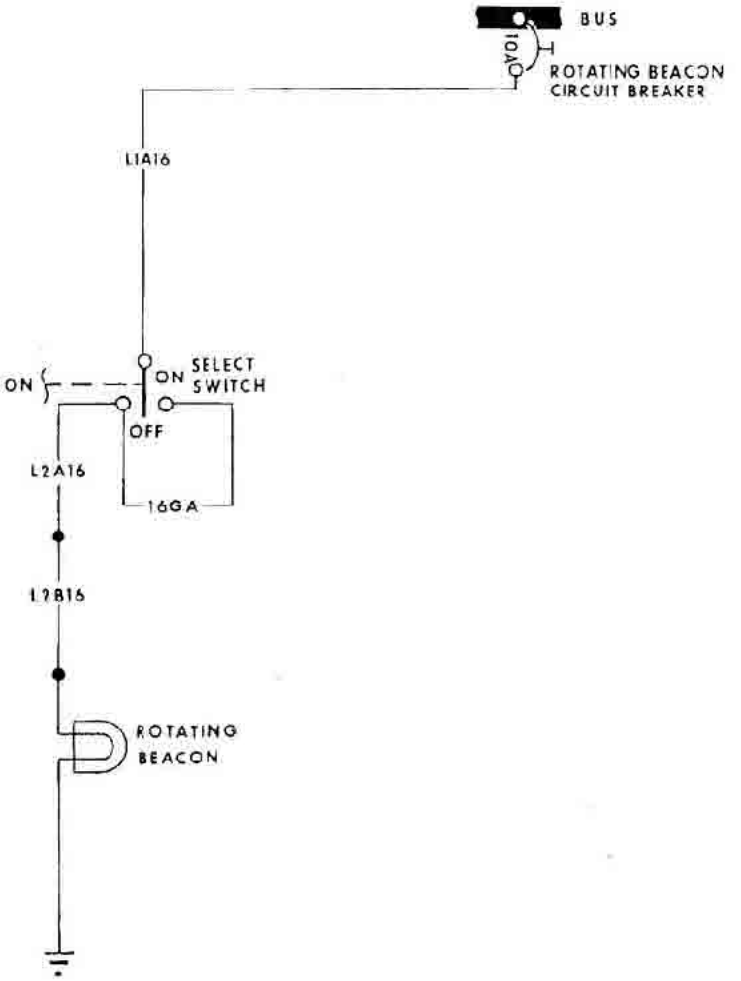
A Wire Furnished With Item And Carries No Code

C23-369-31A

Rotating Beacon
M-1285 thru M-1297
MA-364 thru MA-368
MB-481 thru MB-492
MC-2 thru MC—44 except MC-22, MC-23, MC-39 and MC-42

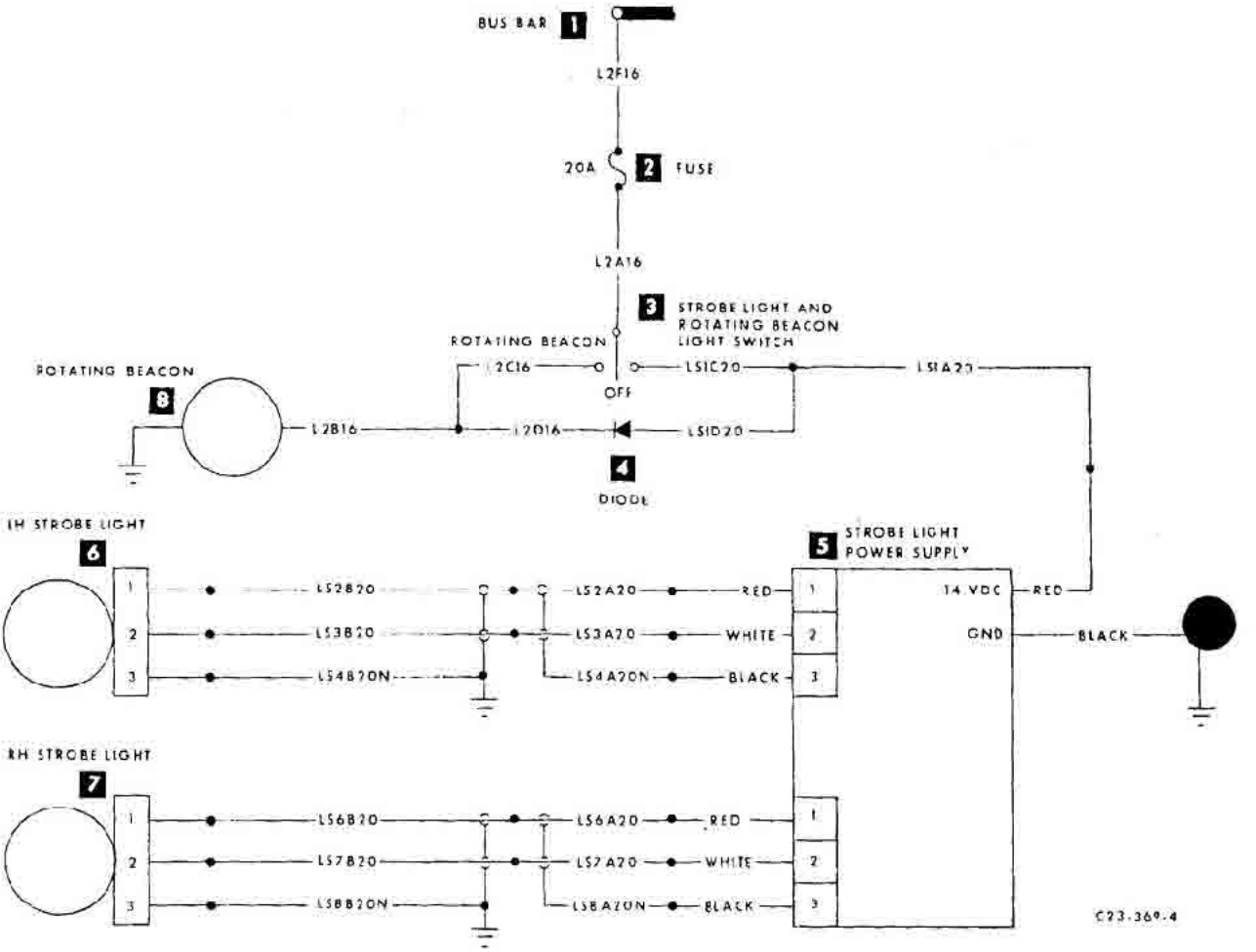


Rotating Beacon
M-1298 thru M-1970, M-1972 thru M-1979
MB-493 thru MB-865
MC-22, MC-23, MC-42, MC-45 thru MC-532,
MC-534 thru MC-536 and previous airplanes
in compliance with S.I. 0413-354



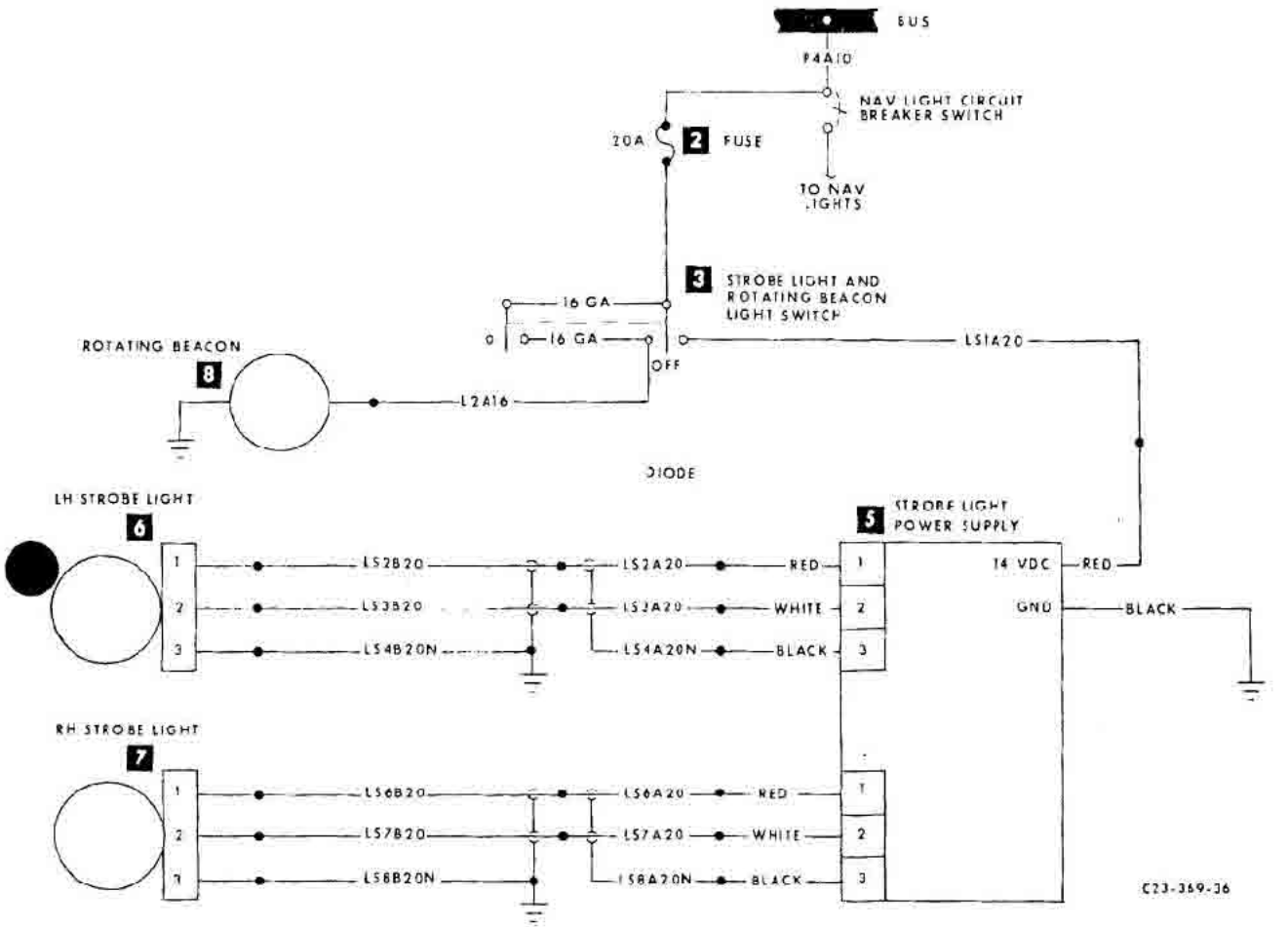
19.369.58

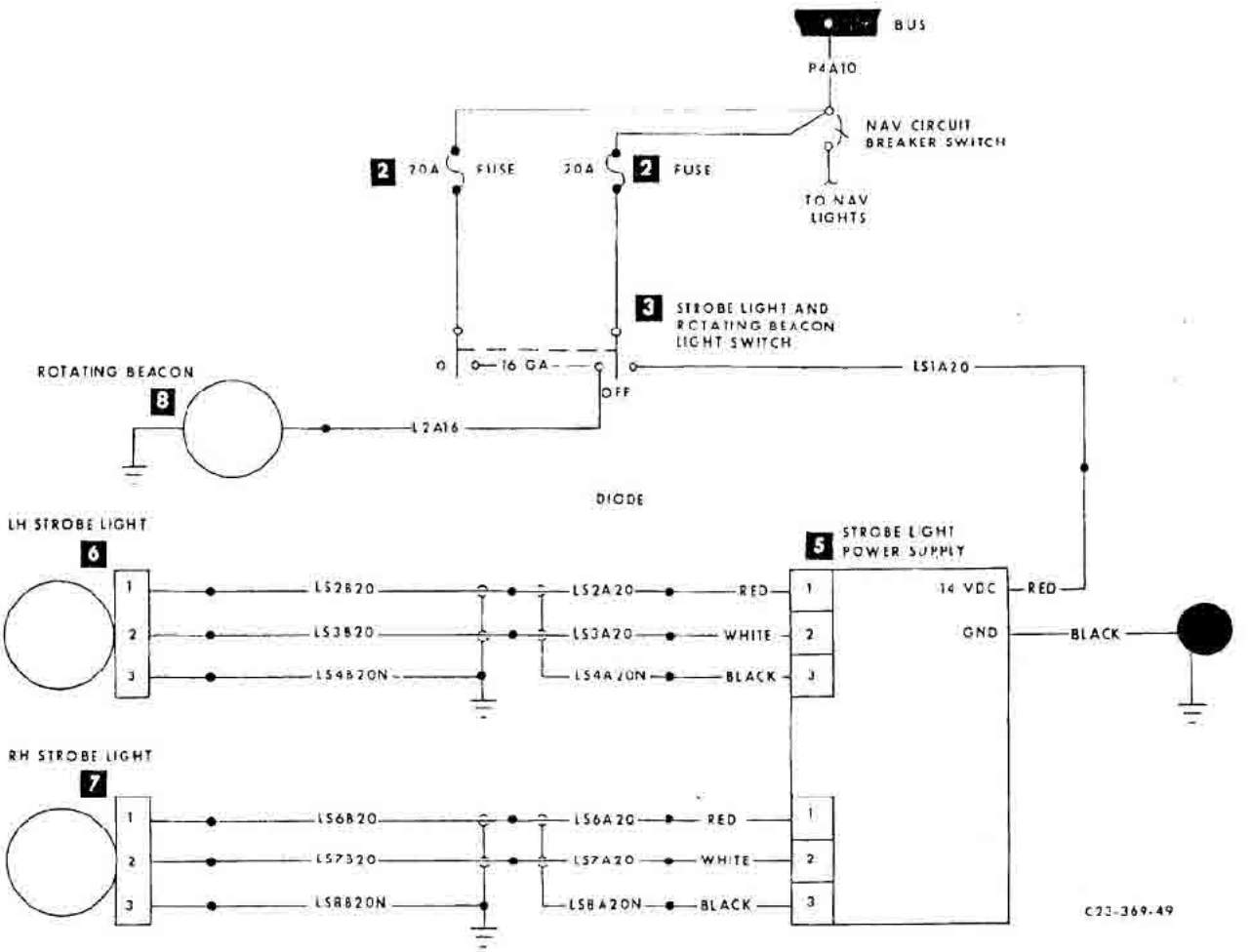
Rotating Beacon (Optional)
M-1971, M-1980 and after
MB-866 and after
MC-533, MC-537 and after



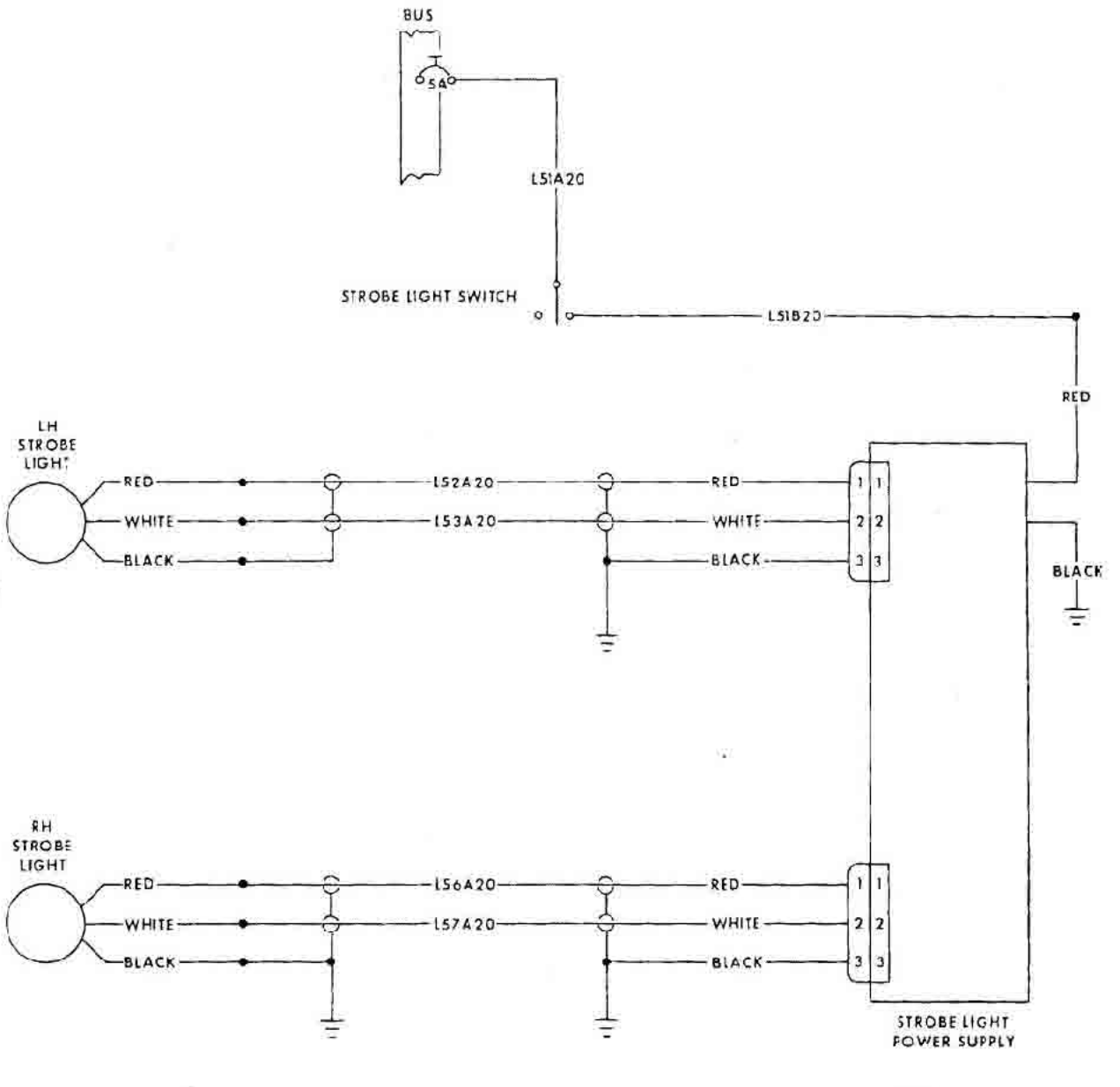
Rotating Beacon and Strobe Lights (Optional)
M-1285 thru M-1297
MA-364 thru MA-368
MB-481 thru MB-492
MC-2, MC-3 thru MC-91

C23-369

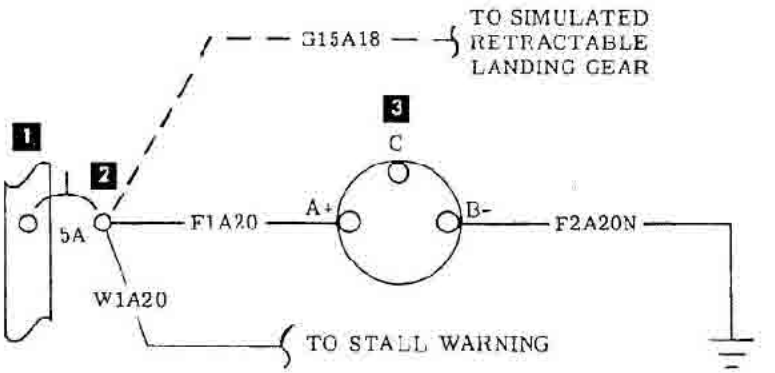

BUS
P4A10
NAV LIGHT CIRCUIT BREAKER SWITCH
20A
2
FUSE
TO NAV LIGHTS
3
STROBE LIGHT AND ROTATING BEACON LIGHT SWITCH
16 GA
16 GA
OFF
LS1A20
ROTATING BEACON
8
L2A16
DIODE
LH STROBE LIGHT
6
5
STROBE LIGHT POWER SUPPLY
LS2B20
LS3B20
LS4B20N
LS2A20
LS3A20
LS4A20N
RED
WHITE
BLACK
14 VDC
GND
RED
BLACK
RH STROBE LIGHT
7
LS6B20
LS7B20
LS8B20N
LS6A20
LS7A20
LS8A20N
RED
WHITE
BLACK
C23-369-36



Rotating Beacon and Strobe Lights (Optional)
M-1827 thru M-1970, M-1972 thru M-1979
MB-796 thru MB-865
MC-416 thru MC-532, MC-534 thru MC-536



Strobe Lights (Optional)
M-1971, M-1980 and after
MB-866 and after
MC-533, MC-537 and after

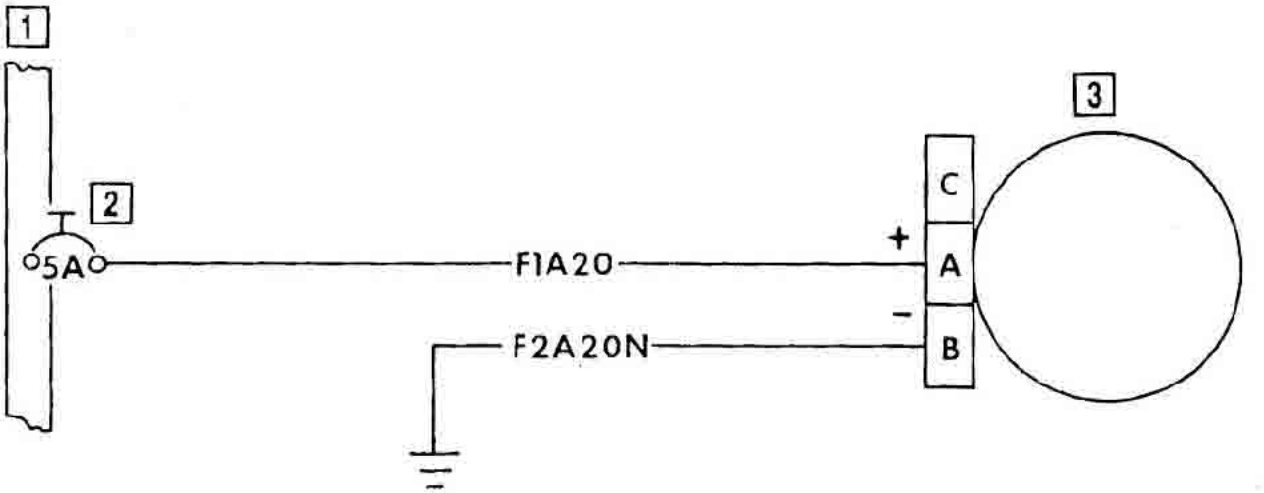


— — — M-1376 AND AFTER
MA-369
MB-531 AND AFTER

1. Bus
2. Circuit Breaker
3. Indicator

23-369-21A

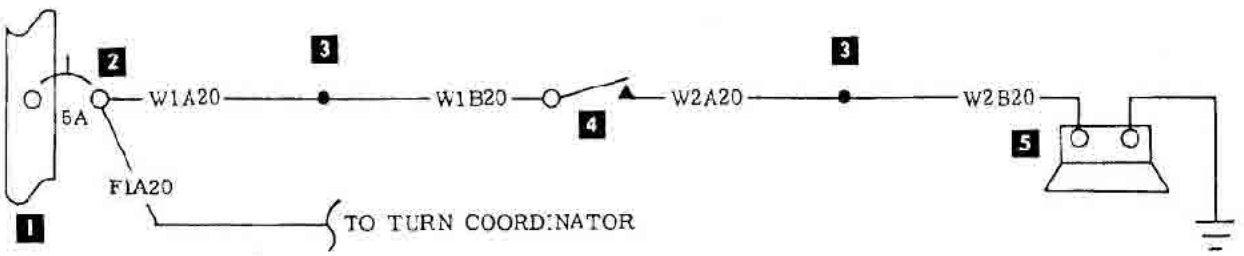
Turn Coordinator
M-555 thru M-1970, M-1972 thru M-1979
MA-1 thru MA-368
MB-1 thru MB-865
MC-2 thru MC-532, MC-534 thru MC-536



1. Bus
2. Circuit Breaker
3. Indicator

19-369-60

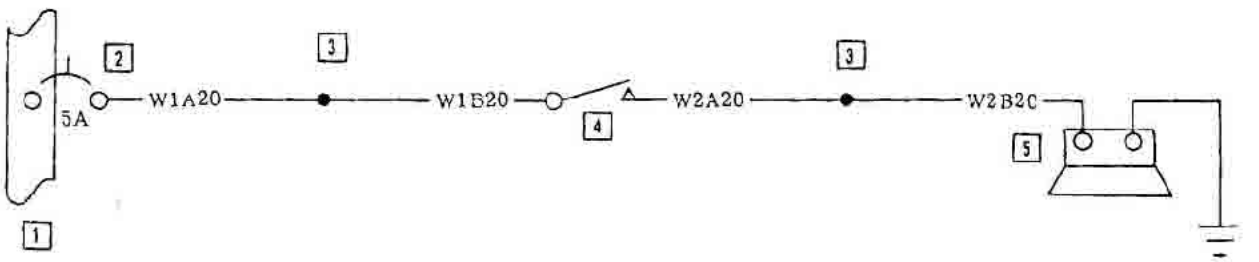
Turn Coordinator (Optional)
M-1971, M-1980 and after
MB-866 and after
MC-533, MC-537 and after



1. Bus Bar
2. Circuit Breaker (5 Amp)
3. Permanent Splice
4. Stall Detecting Switch
5. Stall Warning Horn

Stall Warning
M-555 thru M-1970, M-1972 thru M-1979
MA-1 thru MA-368
MB-1 thru MB-865
MC-2 thru MC-532, MC-534 thru MC-536

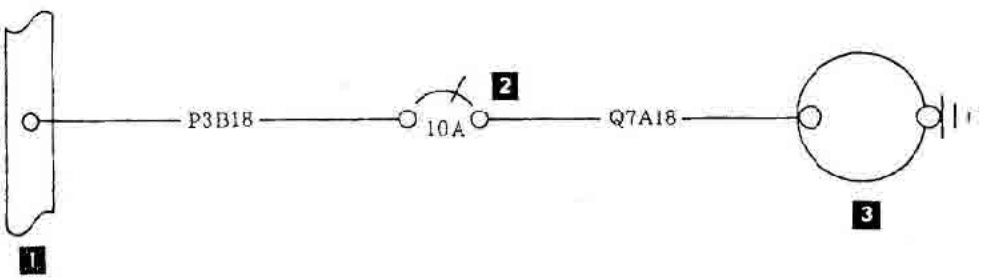
23-369-22



1. Bus Bar
2. Circuit Breaker (5 Amp)
3. Permanent Splice
4. Stall Detecting Switch
5. Stall Warning Horn

19-369-61

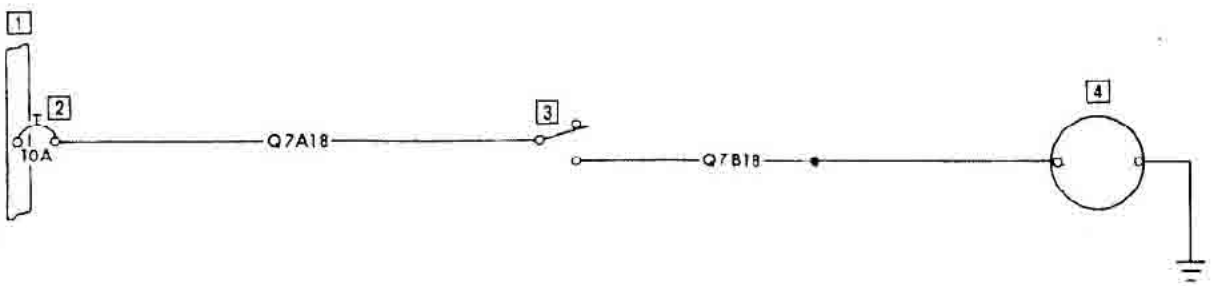
Stall Warning
M-1971, M-1980 and after
MB-866 and after
MC-533, MC-537 and after



1. Bus Bar
2. Circuit Breaker
3. Fuel Boost Pump

23-369-24

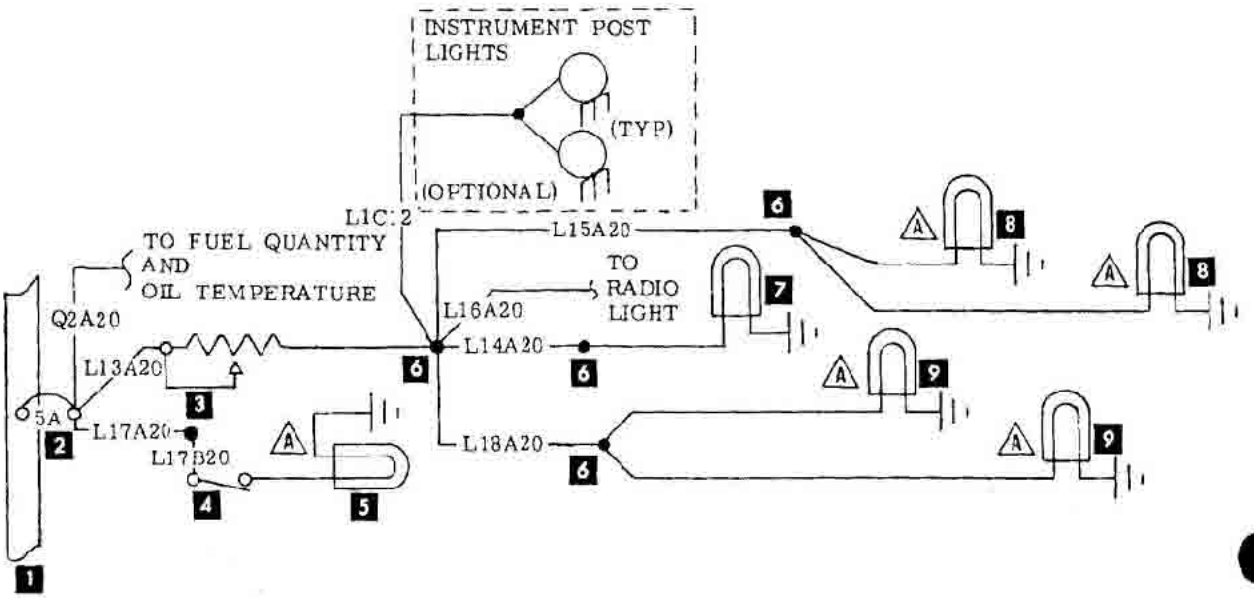
Fuel Boost Pump
M-555 thru M-1970, M-1972 thru M-1979
MA-1 thru MA-368
MB-1 thru MB-865
MC-2 thru MC-532, MC-534 thru MC-536



1. Bus Bar
2. Circuit Breaker
3. Fuel Boost Switch
4. Fuel Boost Pump

19-369-62

Fuel Boost Pump
M-1971, M-1980 and after
MB-866 and after
MC-533, MC-537 and after

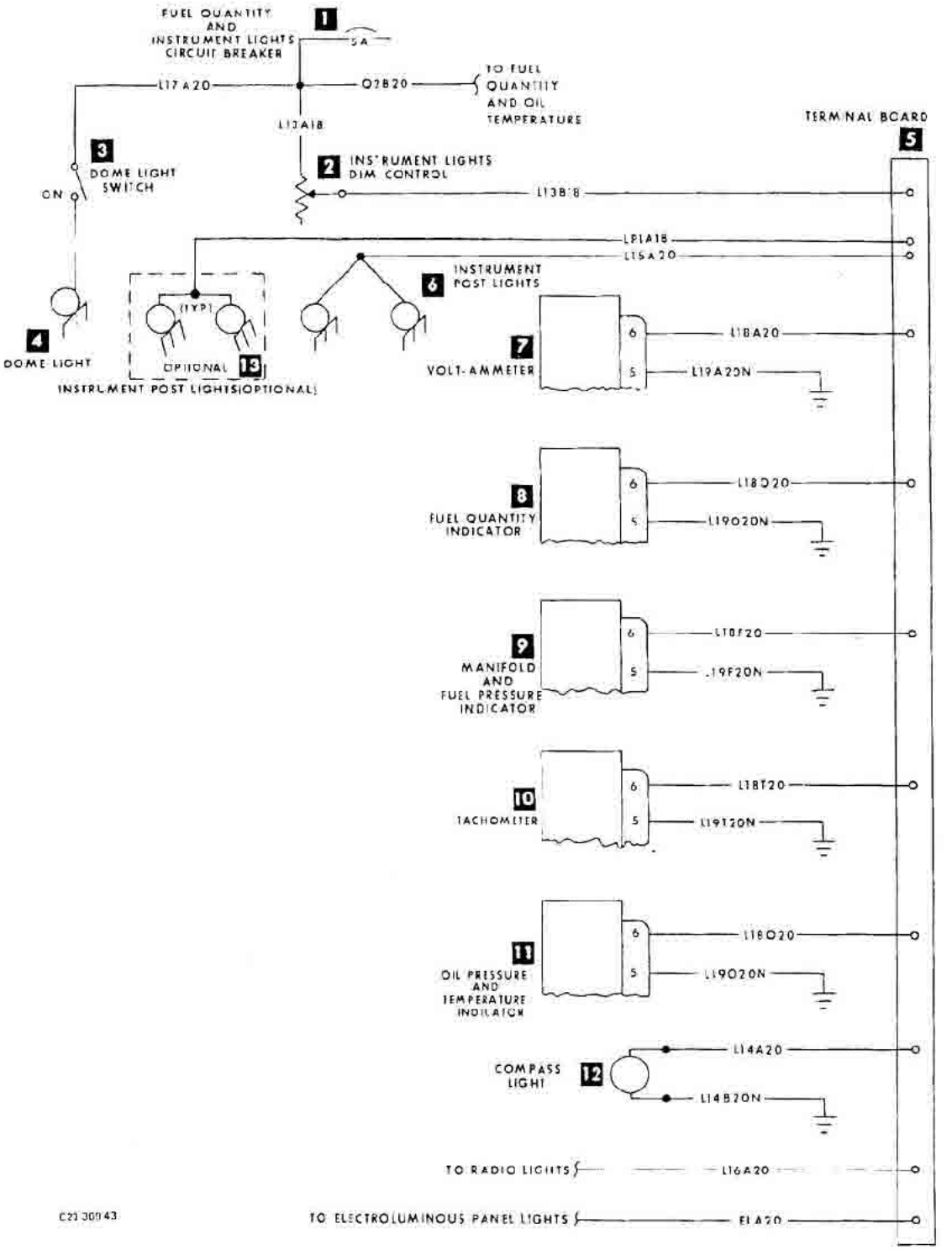


A Wire Furnished With Item And Carries no Code

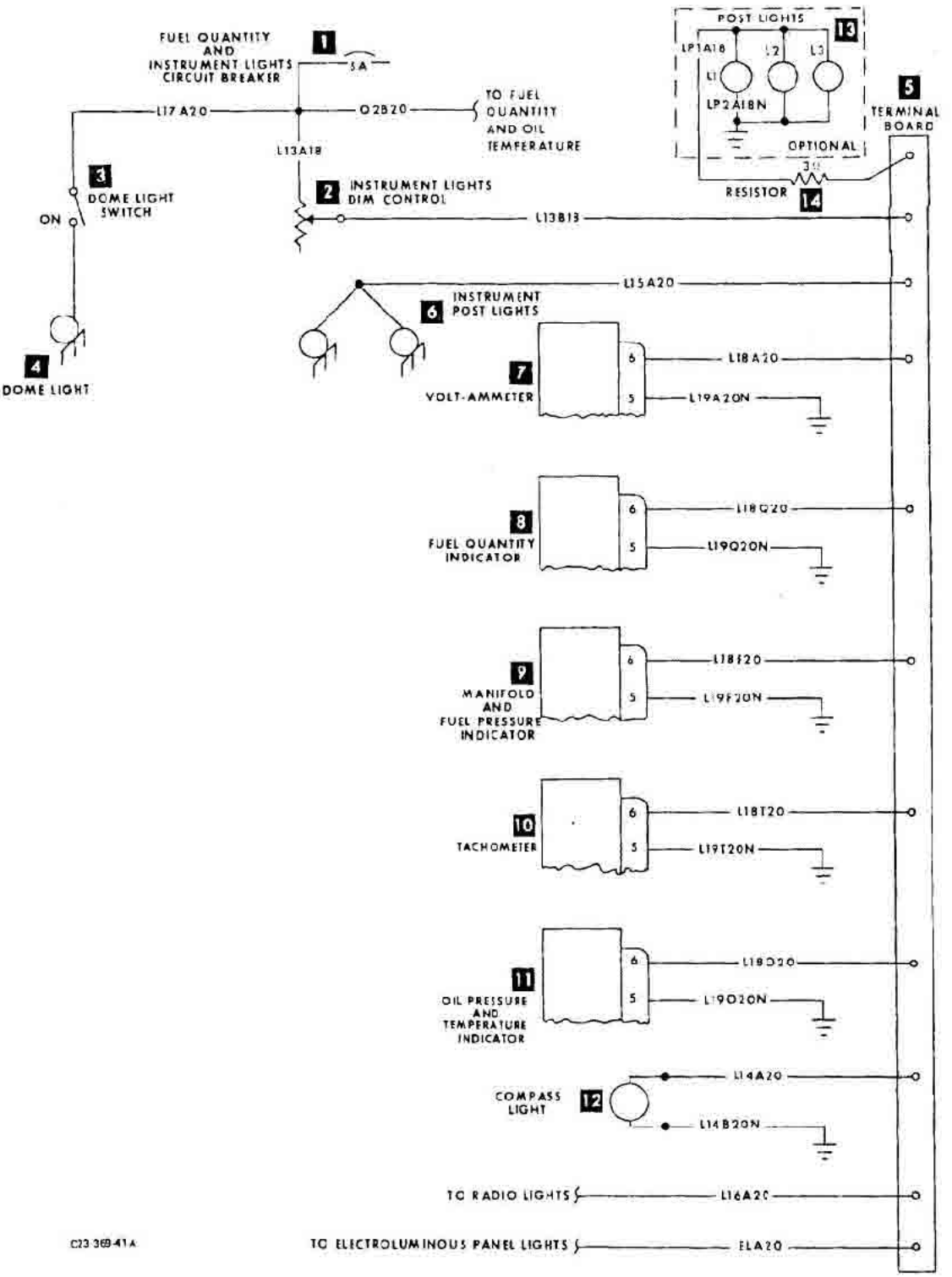
1. Bus Bar
2. Circuit Breaker (5 amp)
3. Dimming Rheostat (25 watt 10 ohm)
4. Dome Light Switch
5. Dome Light
6. Permanent Splice
7. Compass Light
8. Instrument Panel Lights
9. Engine Instrument Lights

23-369-40

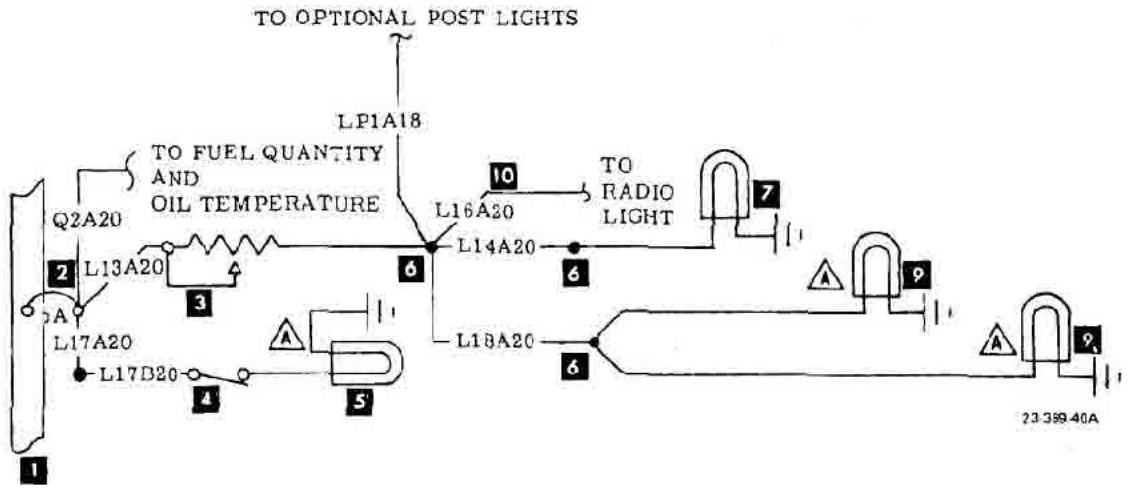
Interior and Instrument Lights
(M-555 thru M-1284, MA-1 thru MA-363, MB-1 thru MB-480)



Interior and Instrument Lights
M-1285 thru M-1301
MA-364 thru MA-368
MB-481 thru MB-493
MC-2 thru MC-69

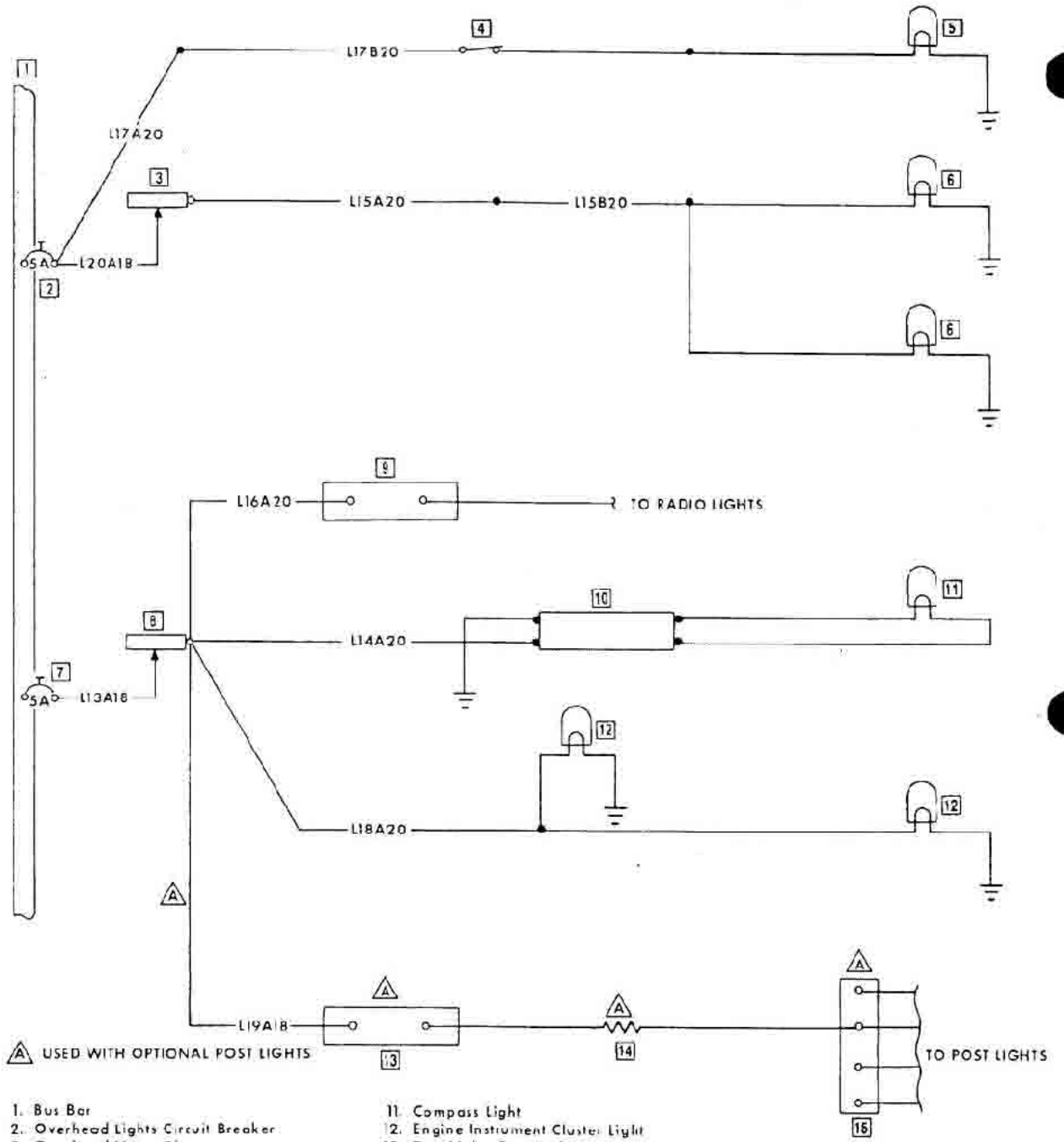


Interior and Instrument Lights
M-1302 thru M-1375
MB-494 thru MB-530
MC-70 thru MC-102



A Wire Furnished With Item And Carries no Code

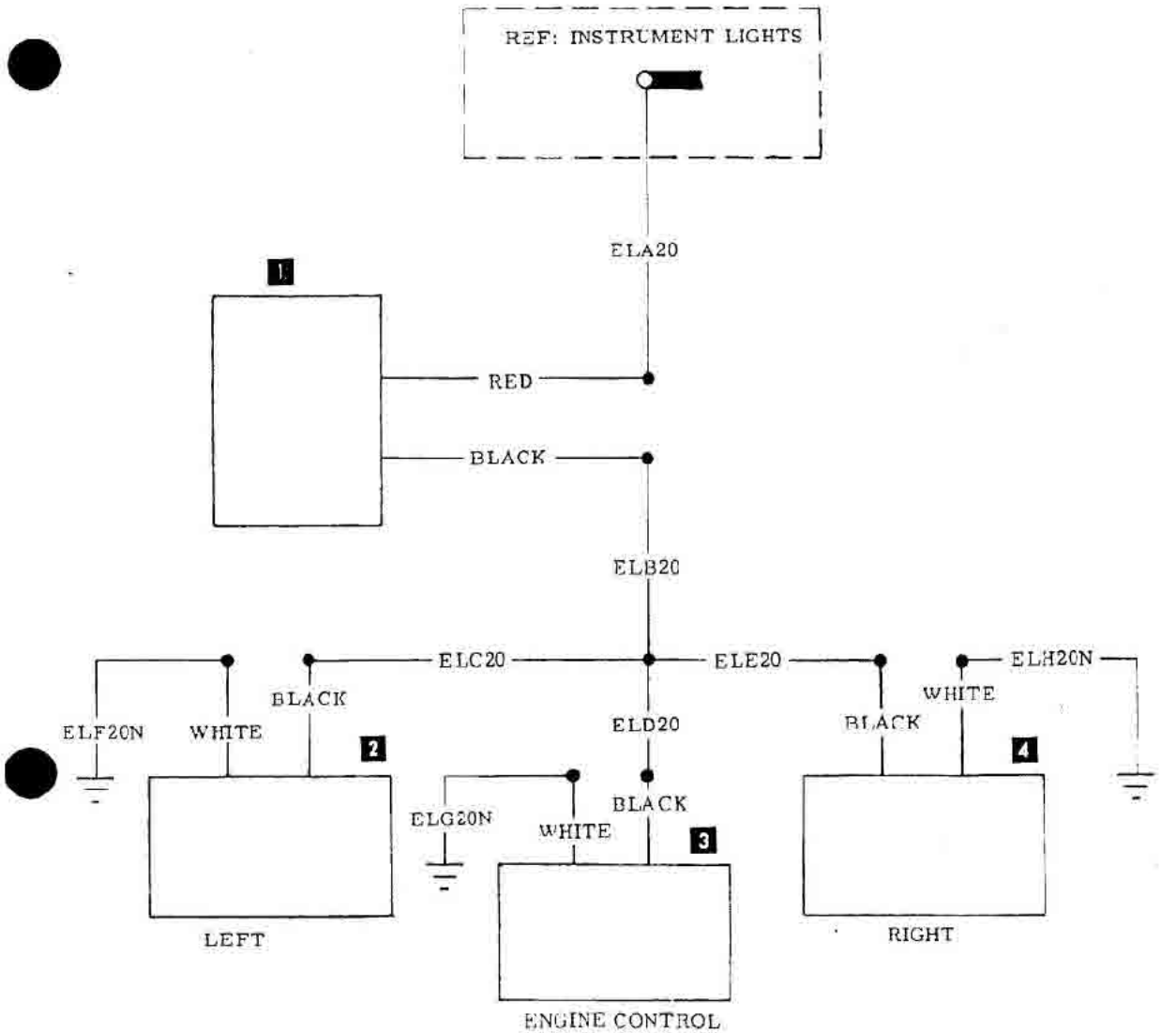
1. Bus Bar
2. Circuit Breaker (5 amp)
3. Dimming Rheostat (25 watt 10 ohm)
4. Dome Light Switch
5. Dome Light
6. Permanent Splice
7. Compass Light
8. Not Used
9. Engine Instrument Lights
10. Disconnect



1. Bus Bar
2. Overhead Lights Circuit Breaker
3. Overhead Lights Rheostat
4. Dome Light Switch
5. Dome Light
6. Overhead Instrument Lights
7. Instrument Lights Circuit Breaker
8. Instrument Lights Rheostat
9. Radio Lights Terminal Strip
10. Compass P.C. Board
11. Compass Light
12. Engine Instrument Cluster Light
13. Post Lights Terminal Strip
14. Post Lights Resistor
15. Post Lights Terminal Strip

19-369-63

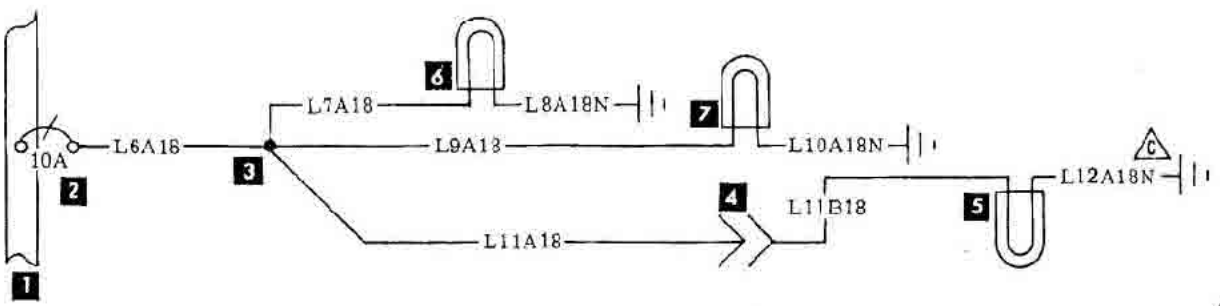
Interior and Instrument Lights
M-1971, M-1980 and after
MB-866 and after
MC-533, MC-537 and after



1. Inverter
2. Left Panel
3. Engine Control Panel
4. Right Panel

Electroluminous Panel Lights
M-1285 thru M-1375
MA-364 thru MA-368
MB-481 thru MB-531
MC-2 thru MC-104

C23-369.9

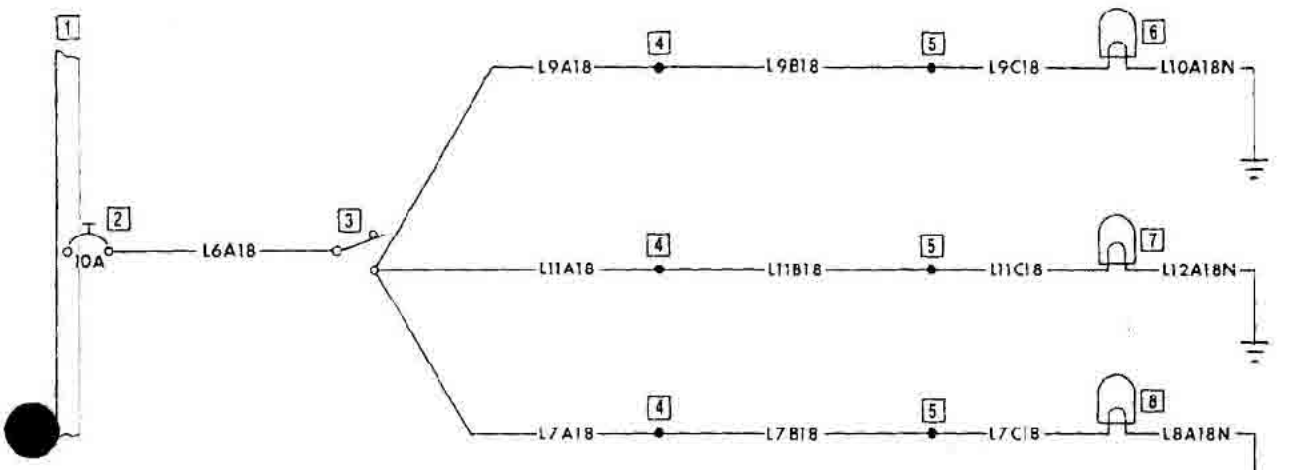


Ⓒ Ground Only On Vertical Stabilizer Structure

1. Bus Bar
2. Circuit Breaker (10 amp)
3. Permanent Splice
4. Disconnect
5. Tail Position Light
6. Left Position Light
7. Right Position Light

23-369-13

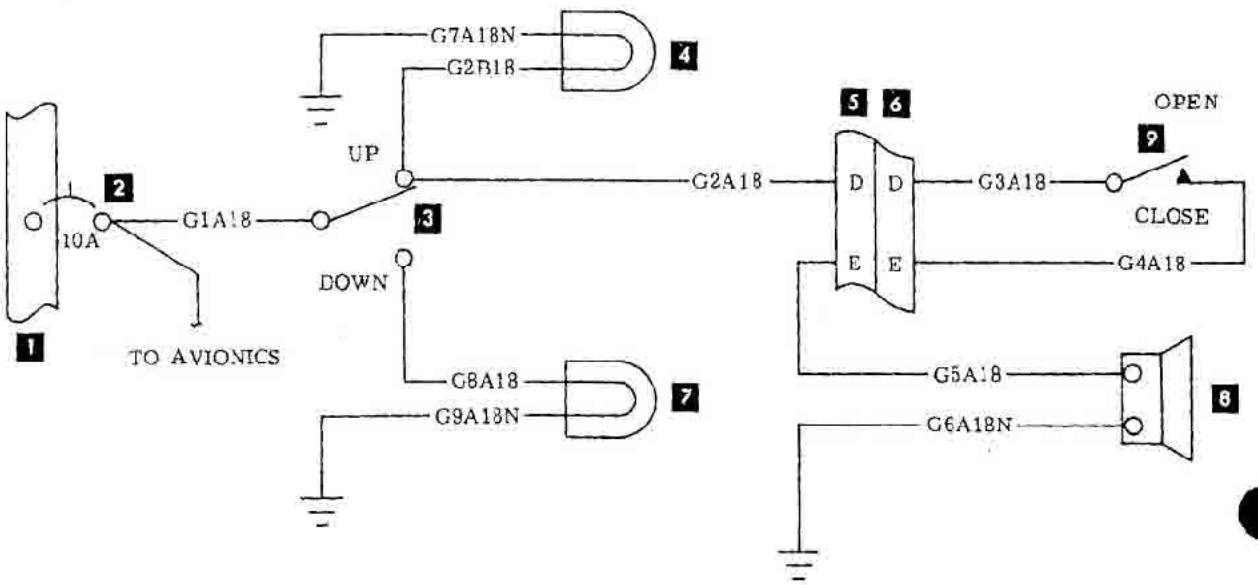
Navigation Lights
M-555 thru M-1970, M-1972 thru M-1979
MA-1 thru MA-368
MB-1 thru MB-865
MC-2 thru MC-532, MC-534 thru MC-536



1. Bus Bar
2. Navigation Light Circuit Breaker
3. Navigation Light Switch
4. Permanent Splice
5. Disconnect
6. Right Position Navigation Light
7. Tail Position Navigation Light
8. Left Position Navigation Light

19-369.64

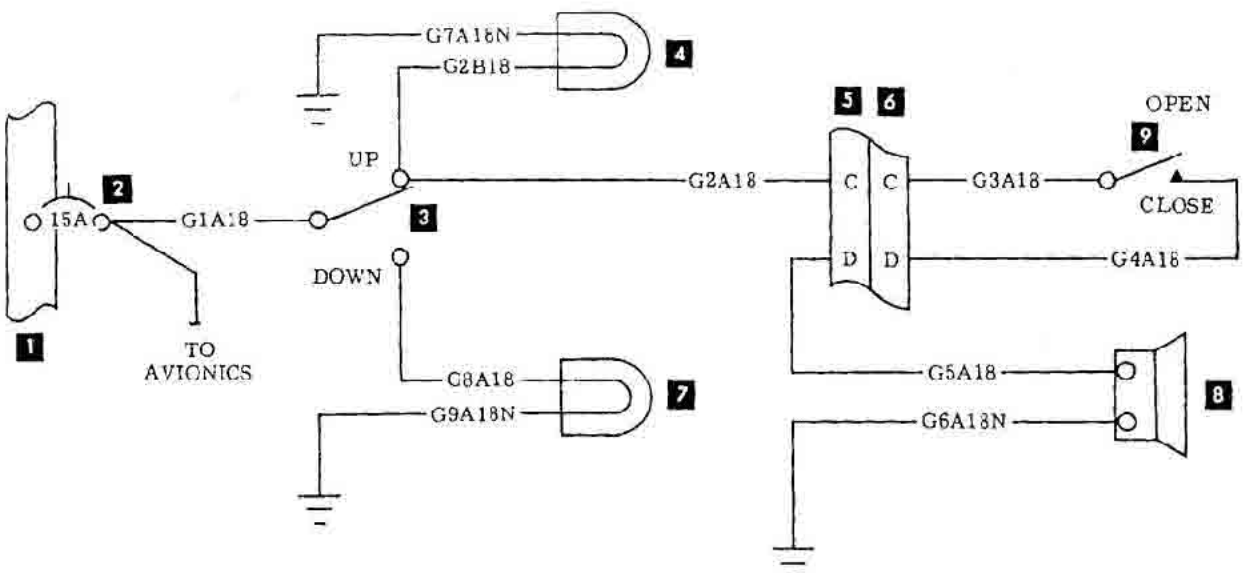
Navigation Lights (Optional)
M-1971, M-1980 and after
MB-866 and after
MC-533, MC-537 and after



1. Bus Bar
2. Circuit Breaker (10 Amp)
   (15 Amp M-584 and after)
3. Landing Gear Control Switch
4. Landing Gear Up Indicator Light (Red)
5. Firewall Plug (Large)
6. Firewall Receptacle (Large)
7. Landing Gear Down Indicator Light (Green)
8. Landing Gear Warning Horn
9. Throttle Switch

23-359-14

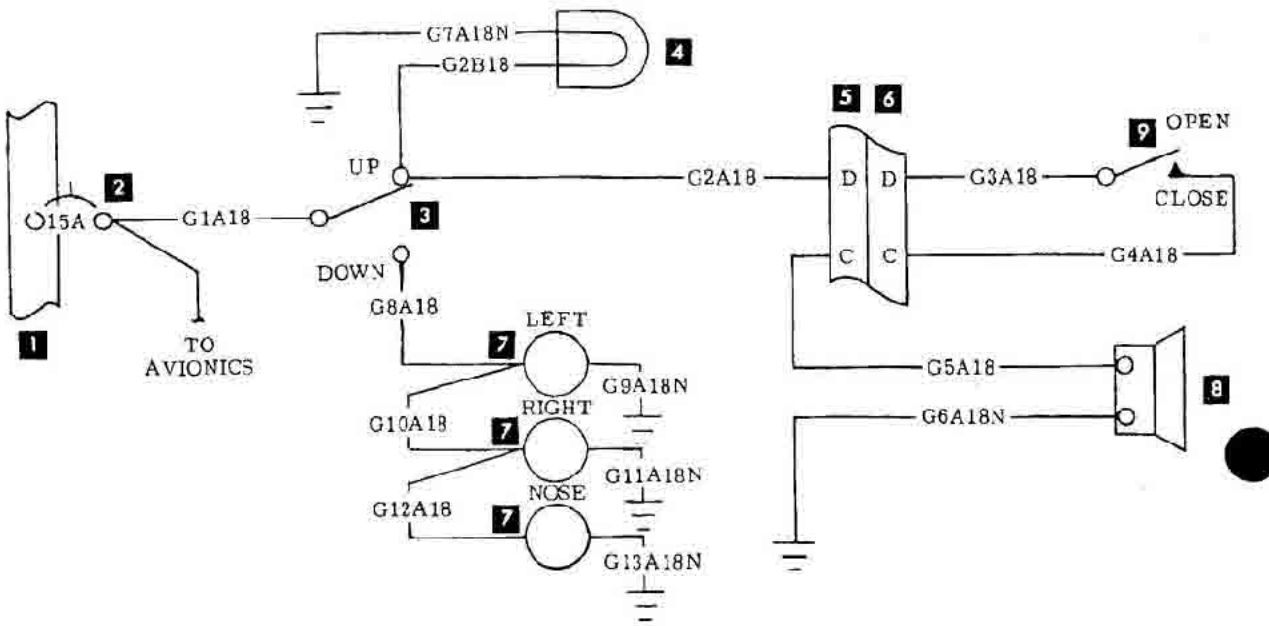
Simulated Retractable Landing Gear
(M-555 thru M-1214, MA-1 thru MA-344,
MB-1 thru MB-412)



1. Bus Bar
2. Circuit Breaker (10 Amp)
3. Landing Gear Control Switch
4. Landing Gear Up Indicator Light (Red)
5. Firewall Plug (Small)
6. Firewall Receptacle (Small)
7. Landing Gear Down Indicator Light (Green)
8. Landing Gear Warning Horn
9. Throttle Switch

23369-6

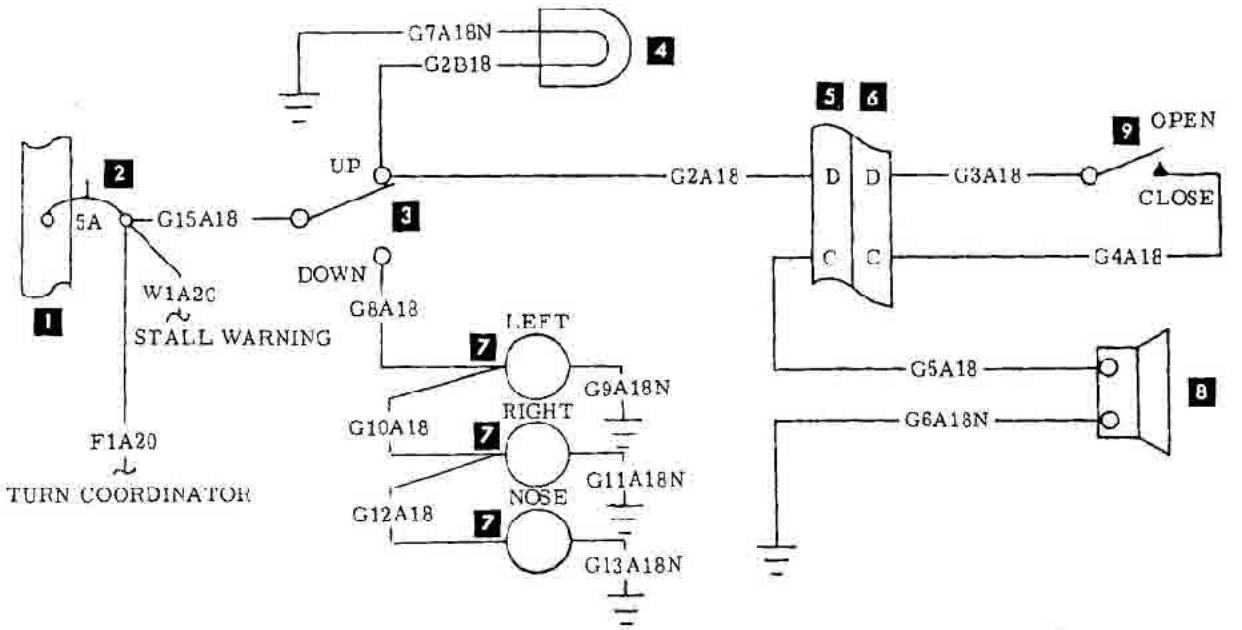
Simulated Retractable Landing Gear
(M-1215 thru M-1284, MA-345 thru MA-363, MB-413 thru MB-480)



1. Bus Bar
2. Circuit Breaker (15 Amp)
3. Landing Gear Control Switch
4. Landing Gear Up Indicator Light (Red)
5. Firewall Plug (Large)
6. Firewall Receptacle (Large)
7. Landing Gear Down Indicator Light (Green)
8. Landing Gear Warning Horn
9. Throttle Switch

Simulated Retractable Landing Gear
M-1285 thru M-1375
MA-364 thru MA-368
MB-481 thru MB-530

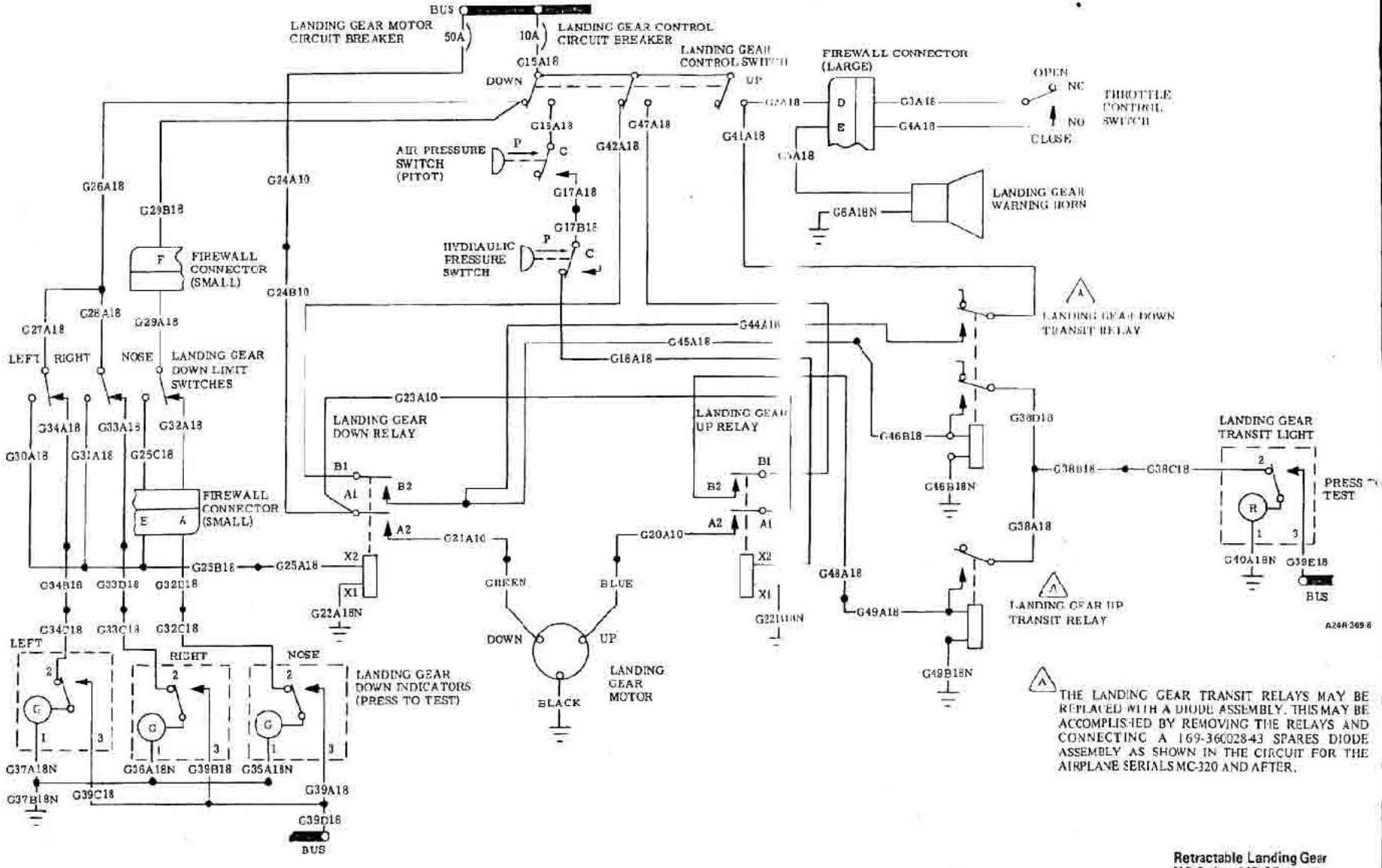
C23369-2



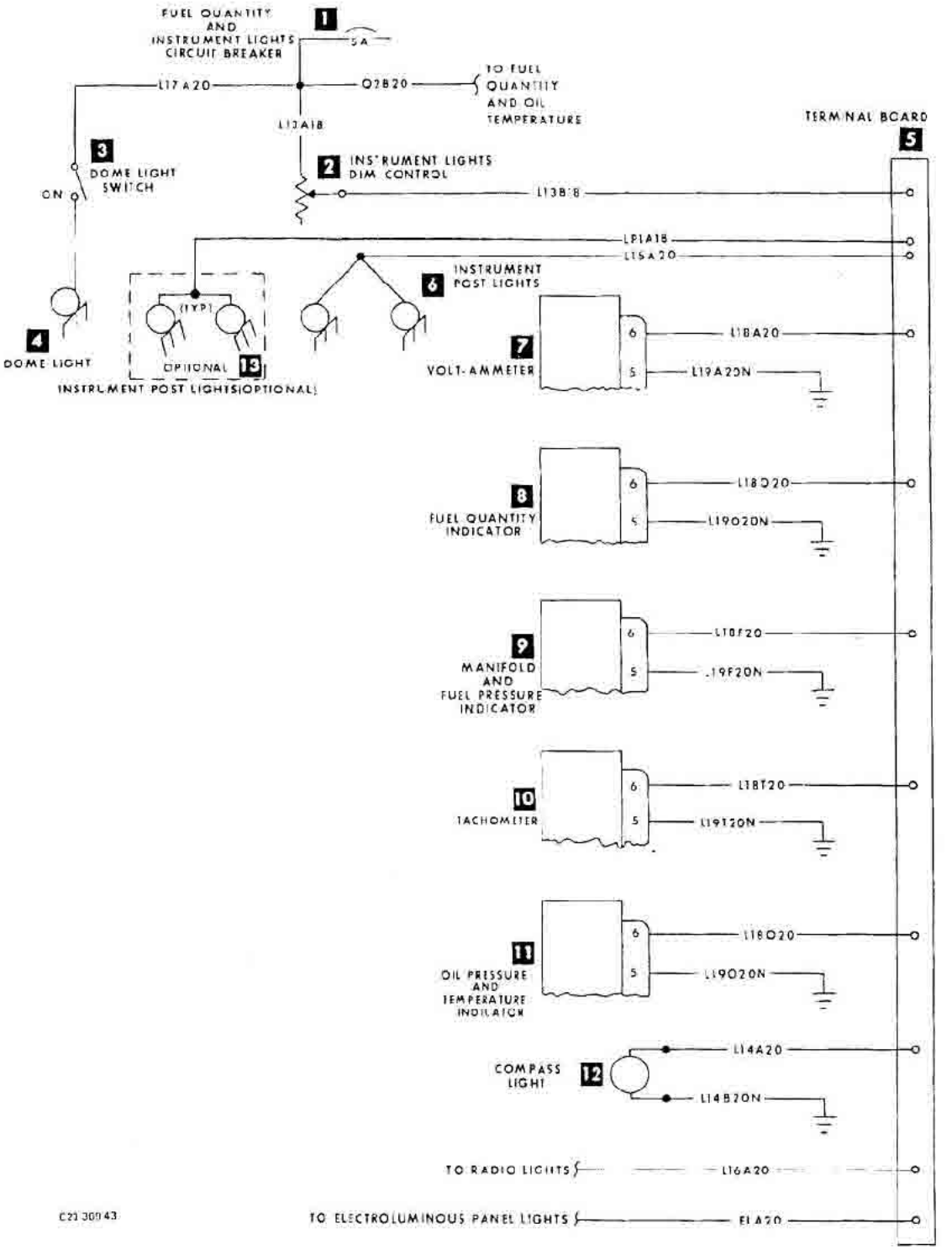
1. Bus Bar
2. Circuit Breaker
3. Landing Gear Control Switch
4. Landing Gear Up Indicator Light (Red)
5. Firewall Plug (Large)
6. Firewall Receptacle (Large)
7. Landing Gear Down Indicator Light (Green)
8. Landing Gear Warning Horn
9. Throttle Switch

C23-369-42

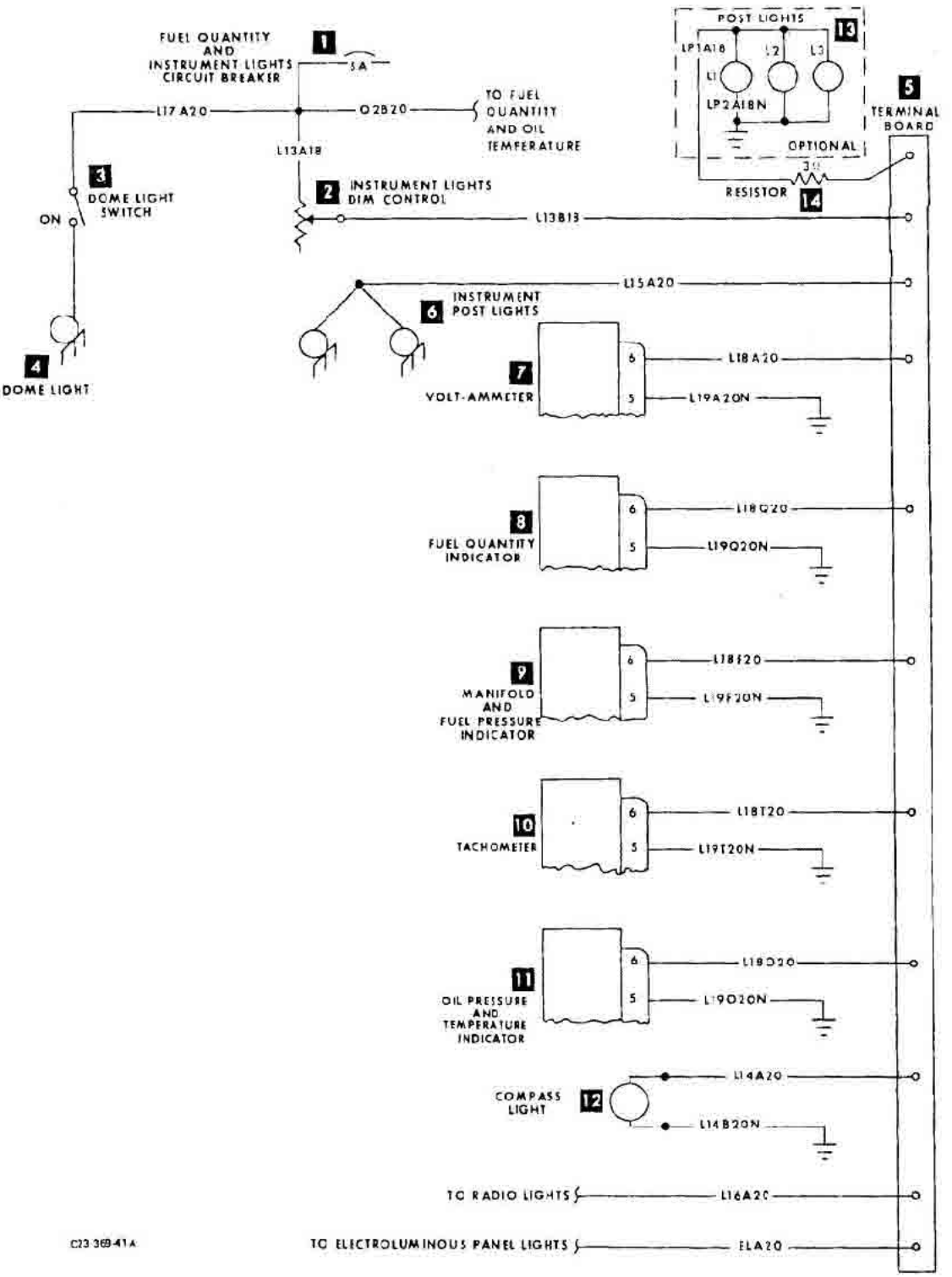
Simulated Retractable Landing Gear
M-1376 and after
MB-531 and after



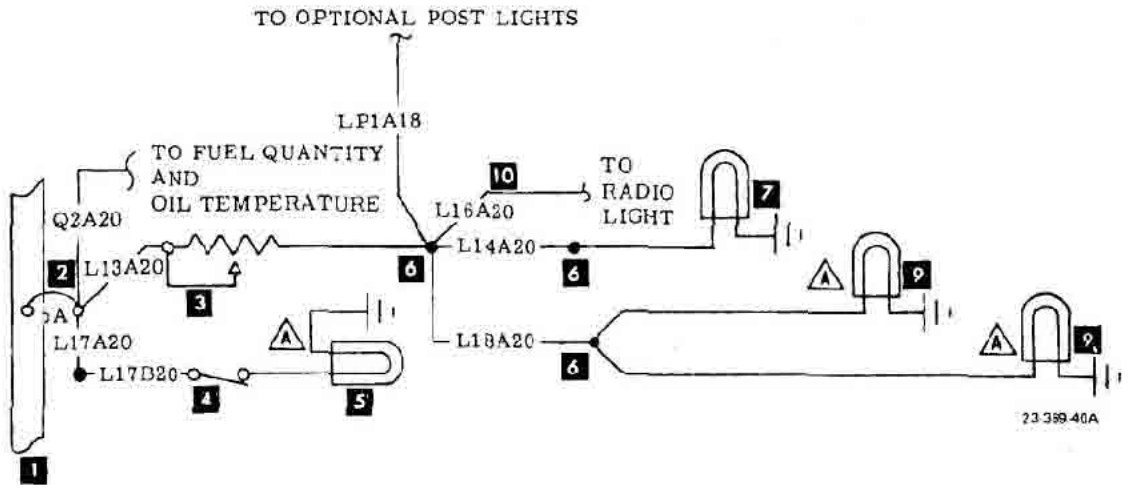
Retractable Landing Gear
MC-2 thru MC-95



Interior and Instrument Lights
M-1285 thru M-1301
MA-364 thru MA-368
MB-481 thru MB-493
MC-2 thru MC-69

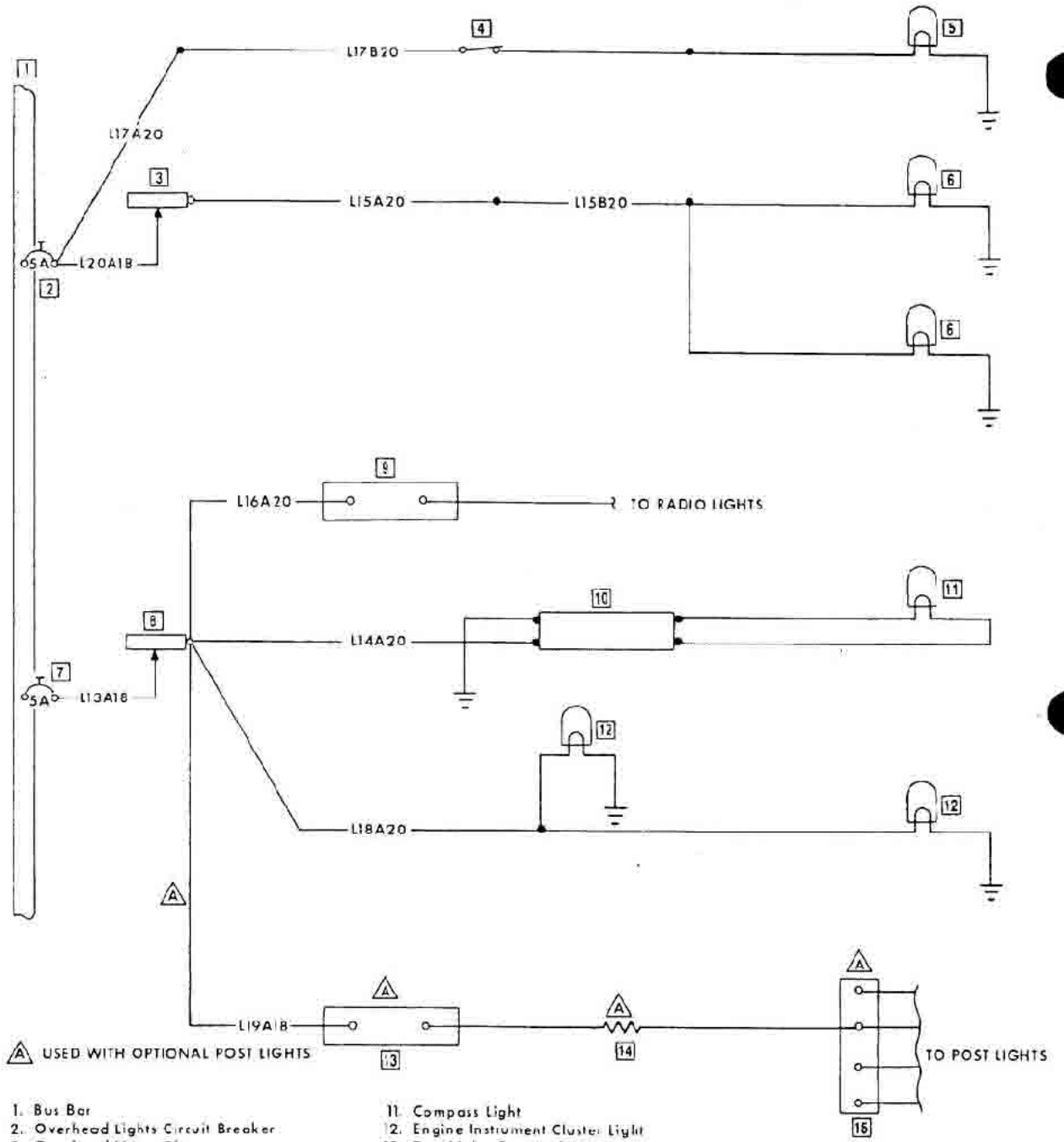


Interior and Instrument Lights
M-1302 thru M-1375
MB-494 thru MB-530
MC-70 thru MC-102



A Wire Furnished With Item And Carries no Code

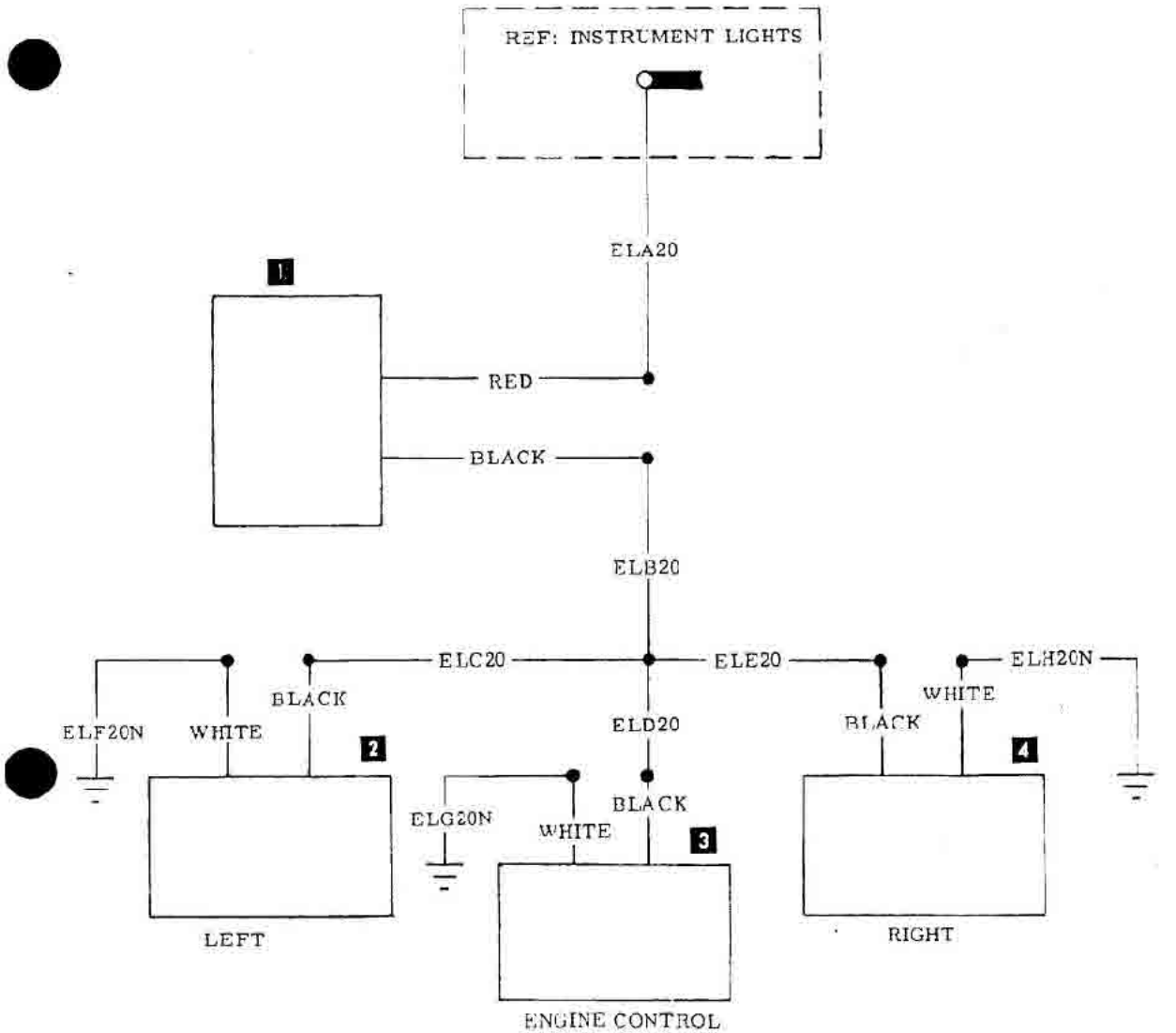
1. Bus Bar
2. Circuit Breaker (5 amp)
3. Dimming Rheostat (25 watt 10 ohm)
4. Dome Light Switch
5. Dome Light
6. Permanent Splice
7. Compass Light
8. Not Used
9. Engine Instrument Lights
10. Disconnect



1. Bus Bar
2. Overhead Lights Circuit Breaker
3. Overhead Lights Rheostat
4. Dome Light Switch
5. Dome Light
6. Overhead Instrument Lights
7. Instrument Lights Circuit Breaker
8. Instrument Lights Rheostat
9. Radio Lights Terminal Strip
10. Compass P.C. Board
11. Compass Light
12. Engine Instrument Cluster Light
13. Post Lights Terminal Strip
14. Post Lights Resistor
15. Post Lights Terminal Strip

19-369-63

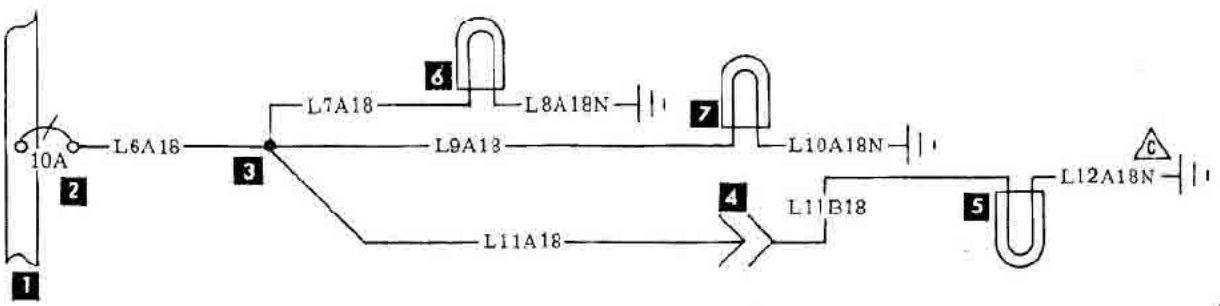
Interior and Instrument Lights
M-1971, M-1980 and after
MB-866 and after
MC-533, MC-537 and after



1. Inverter
2. Left Panel
3. Engine Control Panel
4. Right Panel

Electroluminous Panel Lights
M-1285 thru M-1375
MA-364 thru MA-368
MB-481 thru MB-531
MC-2 thru MC-104

C23-369.9

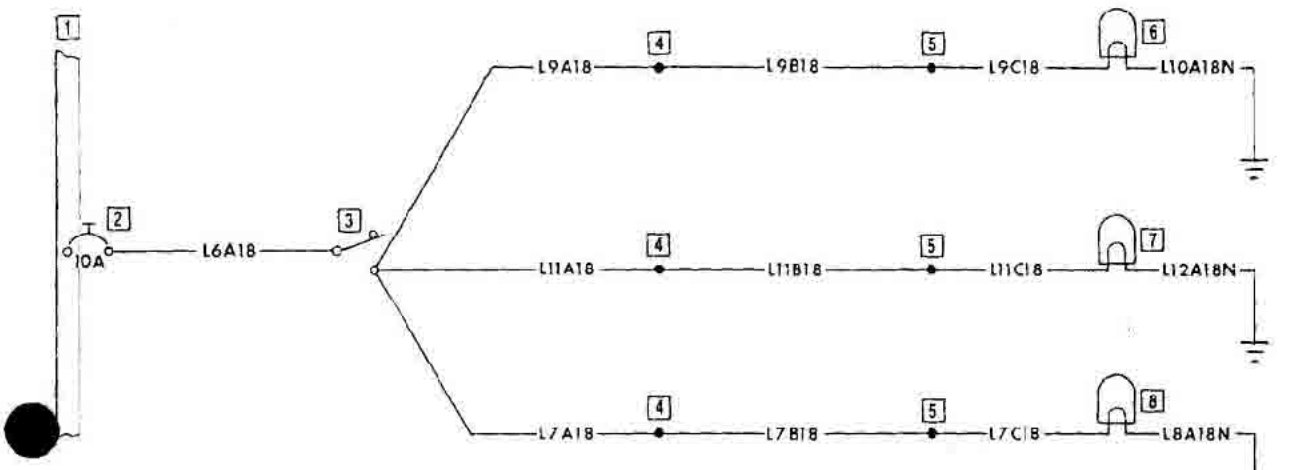


Ⓒ Ground Only On Vertical Stabilizer Structure

1. Bus Bar
2. Circuit Breaker (10 amp)
3. Permanent Splice
4. Disconnect
5. Tail Position Light
6. Left Position Light
7. Right Position Light

23-369-13

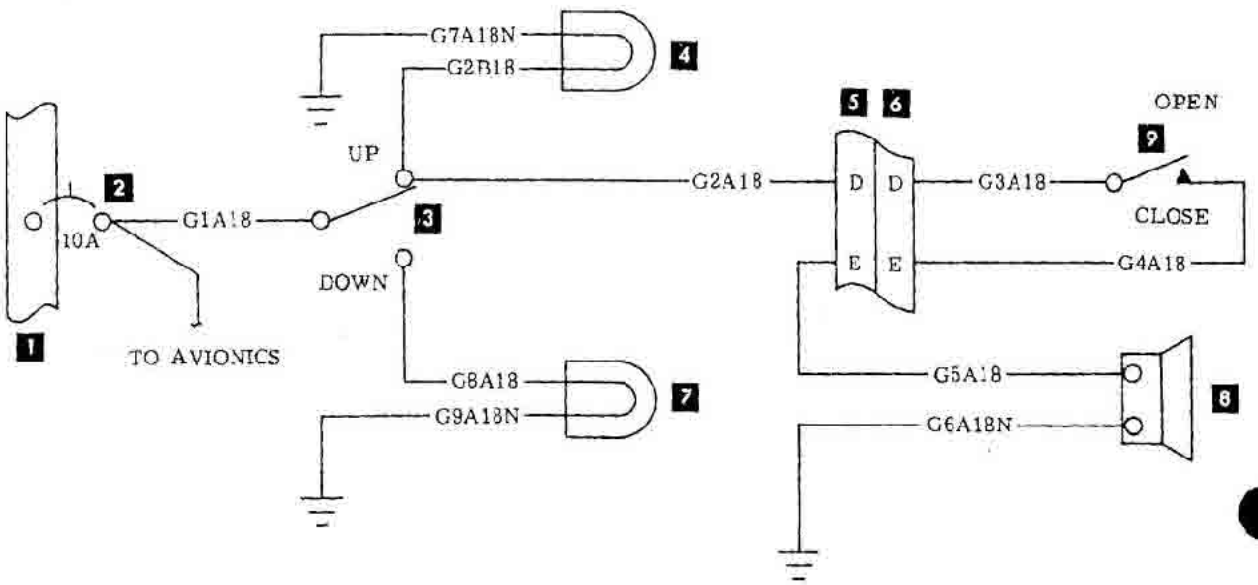
Navigation Lights
M-555 thru M-1970, M-1972 thru M-1979
MA-1 thru MA-368
MB-1 thru MB-865
MC-2 thru MC-532, MC-534 thru MC-536



1. Bus Bar
2. Navigation Light Circuit Breaker
3. Navigation Light Switch
4. Permanent Splice
5. Disconnect
6. Right Position Navigation Light
7. Tail Position Navigation Light
8. Left Position Navigation Light

19-369.64

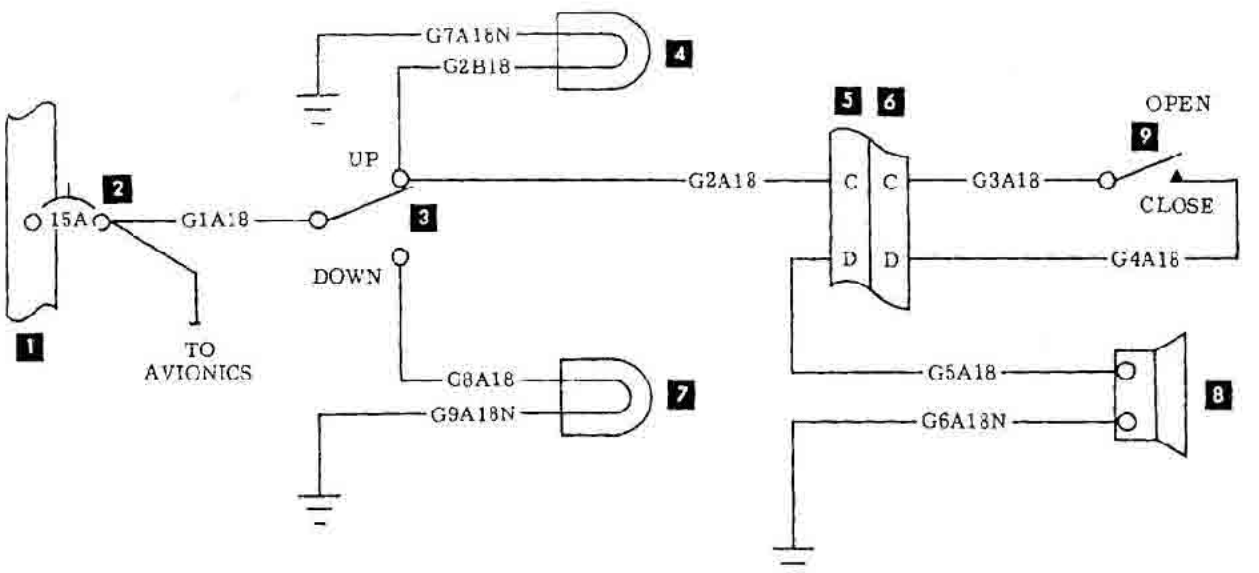
Navigation Lights (Optional)
M-1971, M-1980 and after
MB-866 and after
MC-533, MC-537 and after



1. Bus Bar
2. Circuit Breaker (10 Amp)
   (15 Amp M-584 and after)
3. Landing Gear Control Switch
4. Landing Gear Up Indicator Light (Red)
5. Firewall Plug (Large)
6. Firewall Receptacle (Large)
7. Landing Gear Down Indicator Light (Green)
8. Landing Gear Warning Horn
9. Throttle Switch

23-359-14

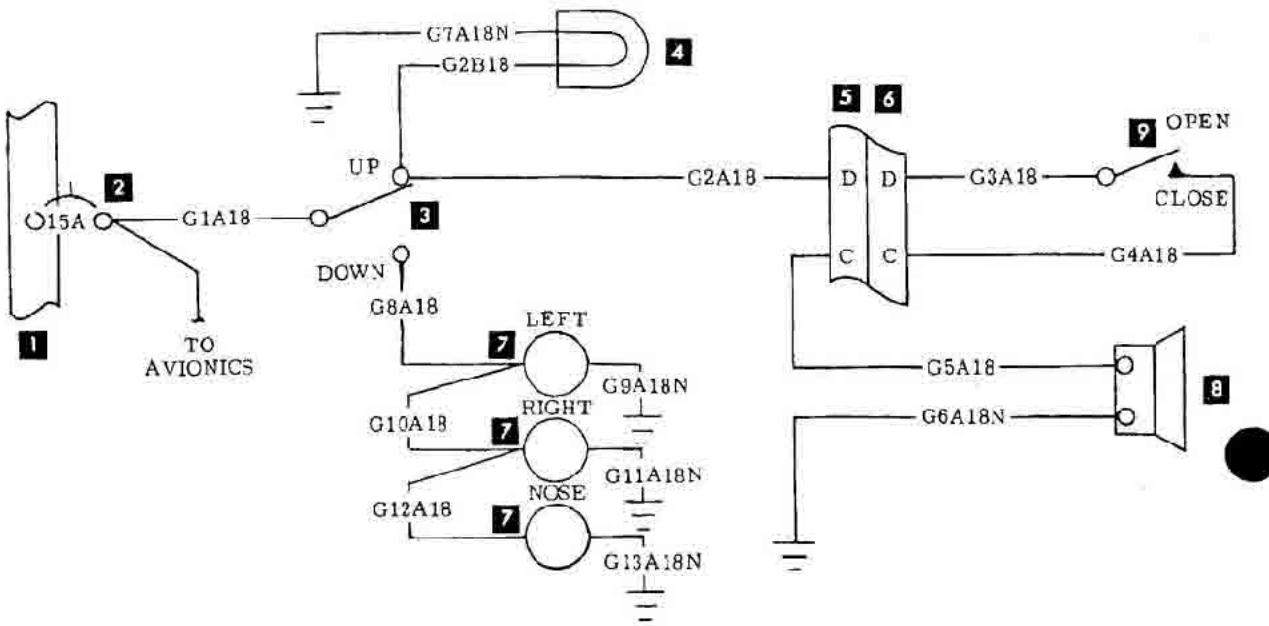
Simulated Retractable Landing Gear
(M-555 thru M-1214, MA-1 thru MA-344,
MB-1 thru MB-412)



1. Bus Bar
2. Circuit Breaker (10 Amp)
3. Landing Gear Control Switch
4. Landing Gear Up Indicator Light (Red)
5. Firewall Plug (Small)
6. Firewall Receptacle (Small)
7. Landing Gear Down Indicator Light (Green)
8. Landing Gear Warning Horn
9. Throttle Switch

23369-6

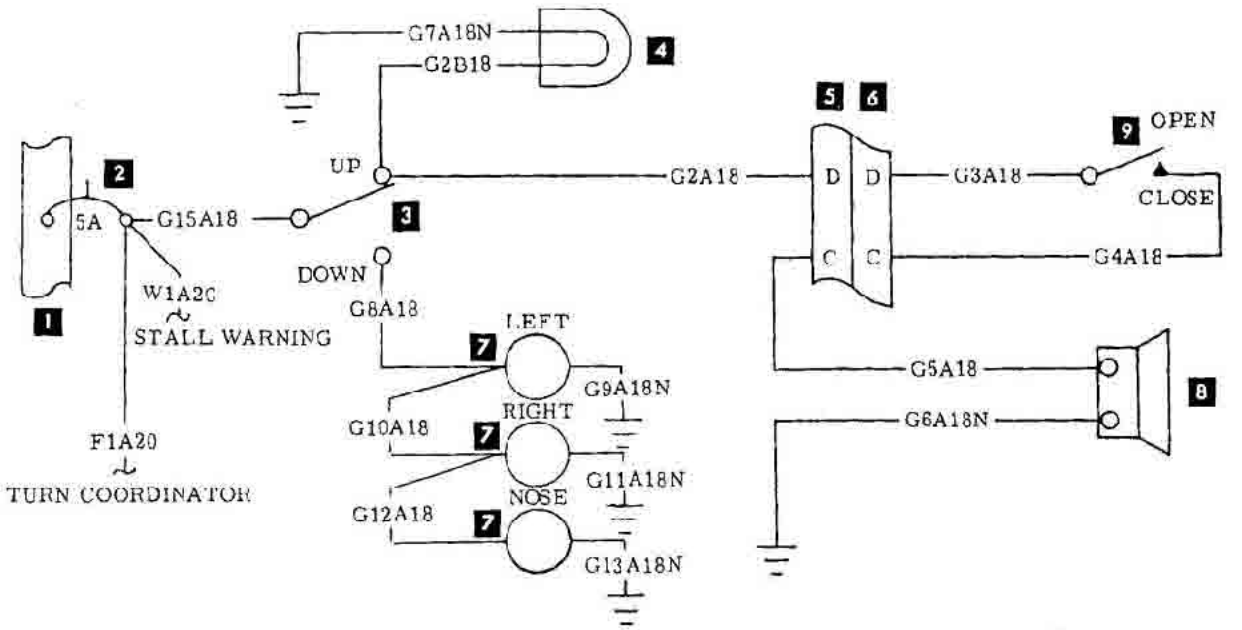
Simulated Retractable Landing Gear
(M-1215 thru M-1284, MA-345 thru MA-363, MB-413 thru MB-480)



1. Bus Bar
2. Circuit Breaker (15 Amp)
3. Landing Gear Control Switch
4. Landing Gear Up Indicator Light (Red)
5. Firewall Plug (Large)
6. Firewall Receptacle (Large)
7. Landing Gear Down Indicator Light (Green)
8. Landing Gear Warning Horn
9. Throttle Switch

Simulated Retractable Landing Gear
M-1285 thru M-1375
MA-364 thru MA-368
MB-481 thru MB-530

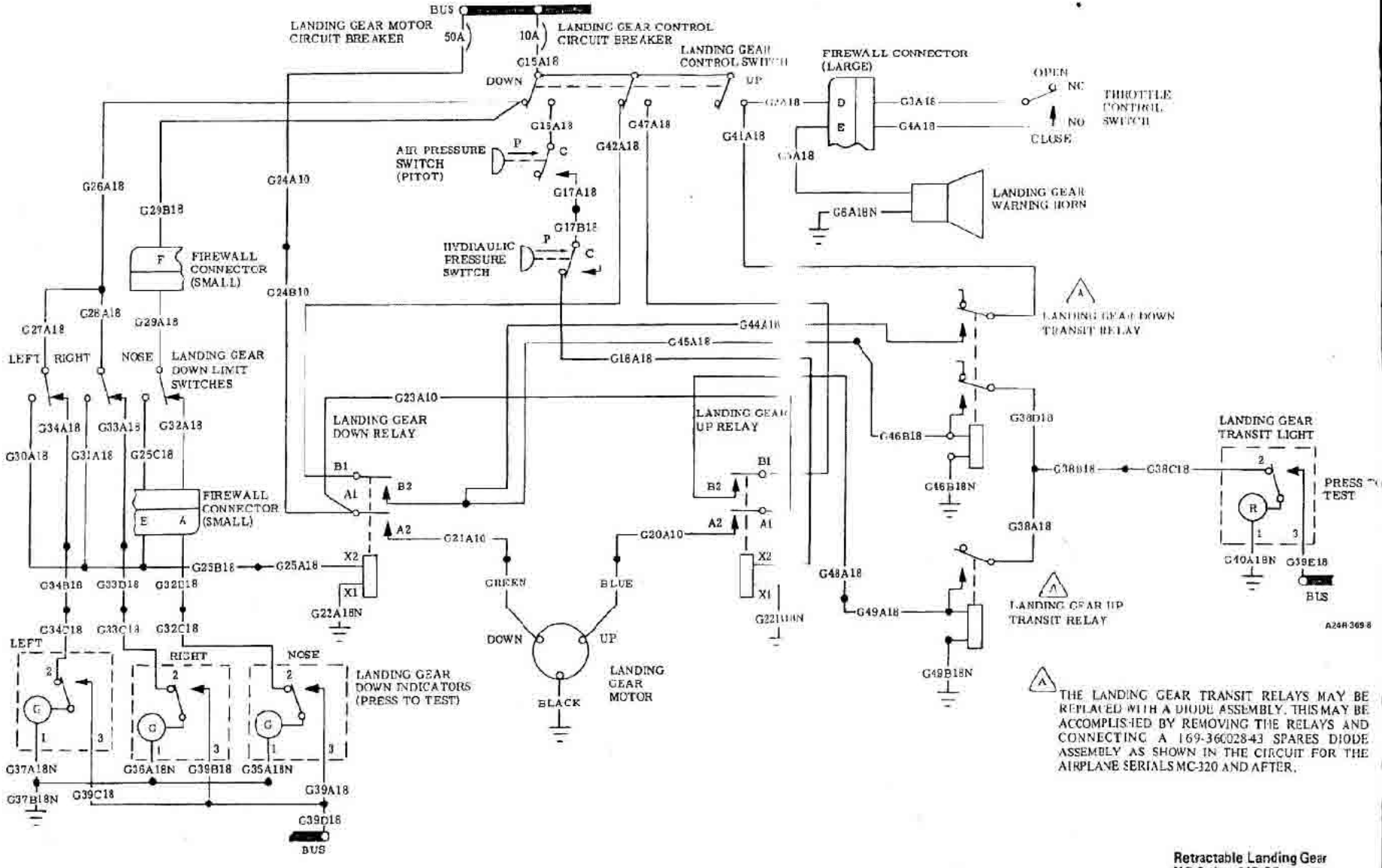
C23369-2



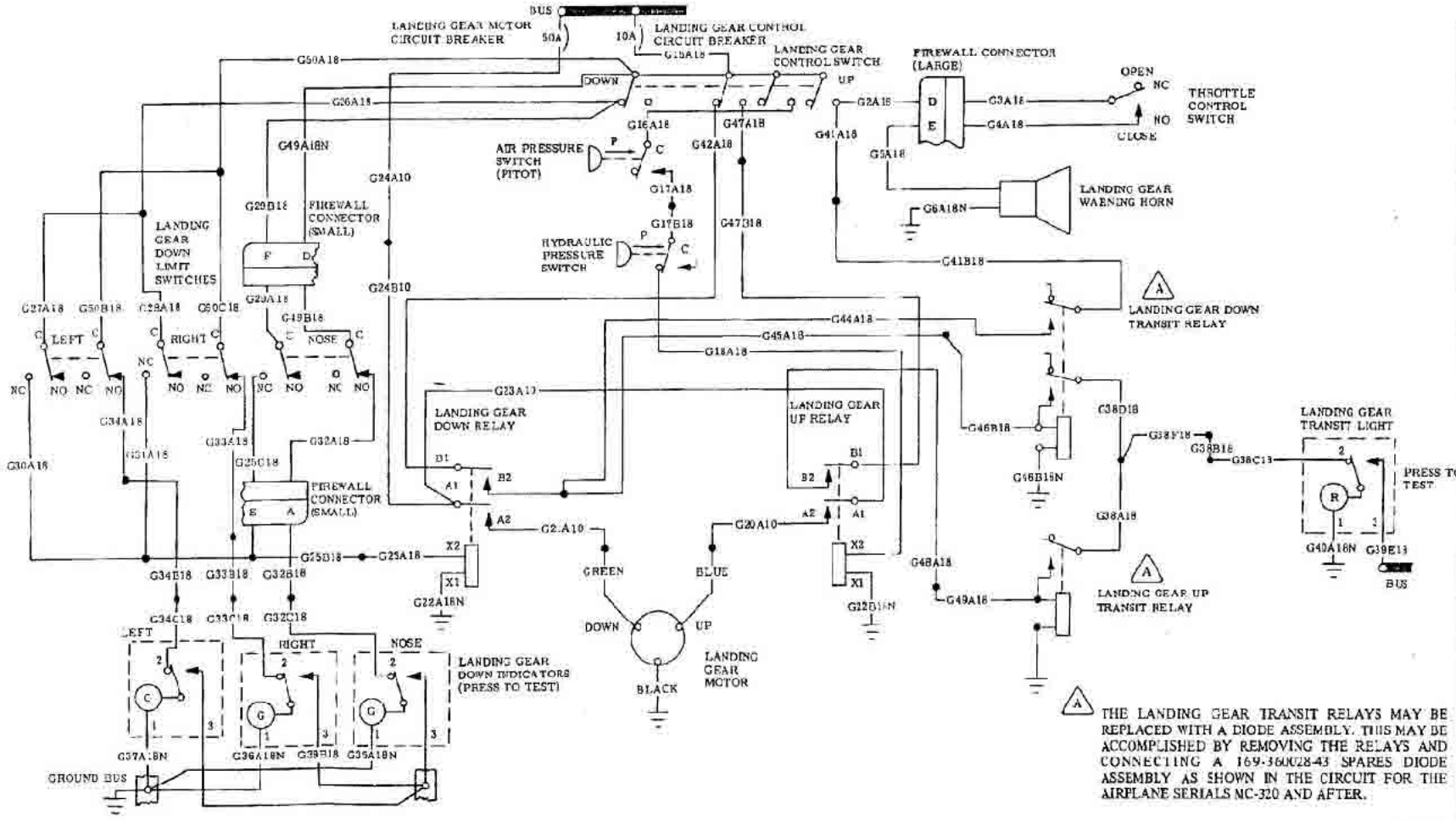
1. Bus Bar
2. Circuit Breaker
3. Landing Gear Control Switch
4. Landing Gear Up Indicator Light (Red)
5. Firewall Plug (Large)
6. Firewall Receptacle (Large)
7. Landing Gear Down Indicator Light (Green)
8. Landing Gear Warning Horn
9. Throttle Switch

C23-369-42

Simulated Retractable Landing Gear
M-1376 and after
MB-531 and after

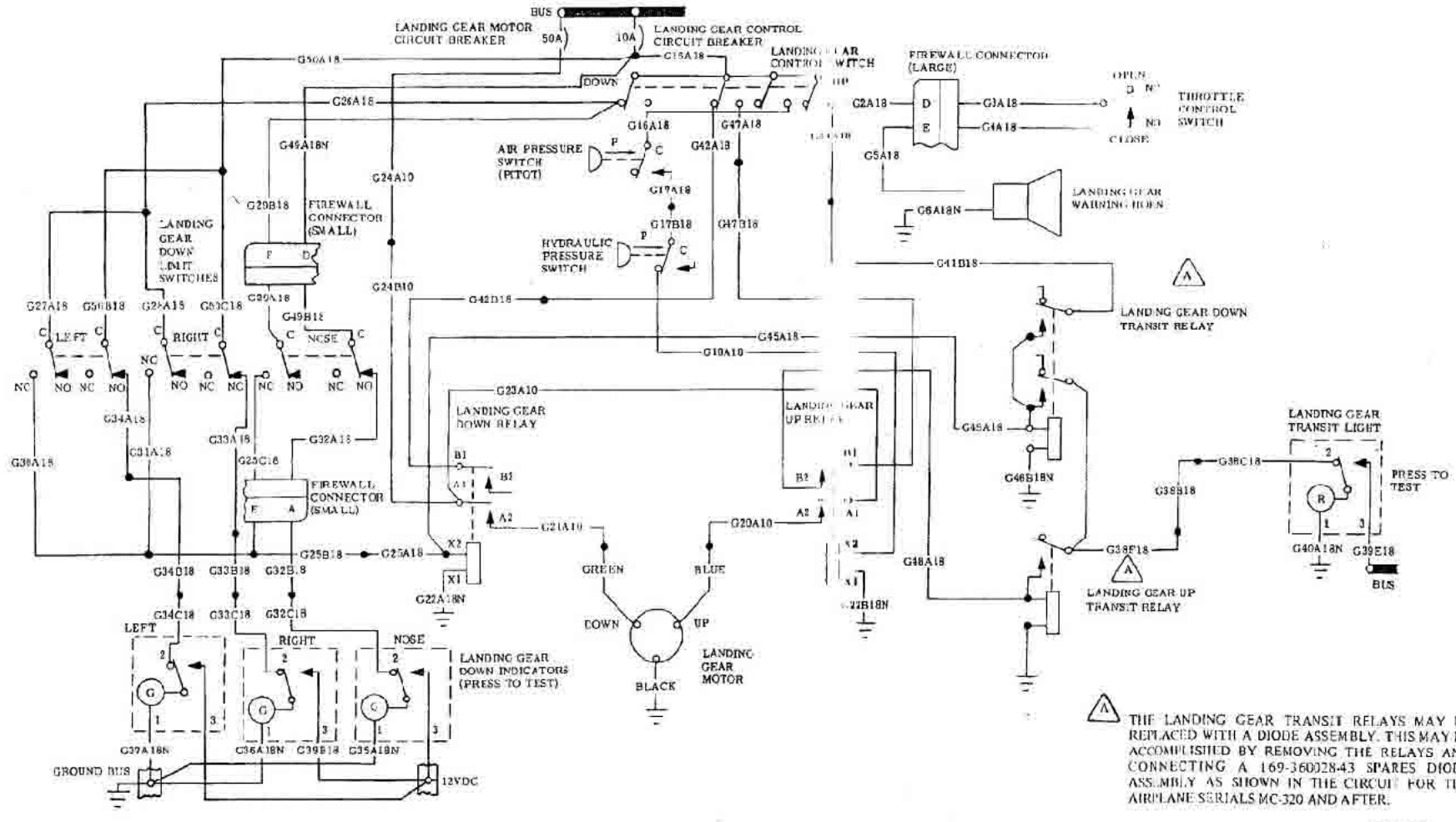


Retractable Landing Gear
MC-2 thru MC-95



THE LANDING GEAR TRANSIT RELAYS MAY BE REPLACED WITH A DIODE ASSEMBLY. THIS MAY BE ACCOMPLISHED BY REMOVING THE RELAYS AND CONNECTING A 169-360028-43 SPARES DIODE ASSEMBLY AS SHOWN IN THE CIRCUIT FOR THE AIRPLANE SERIALS MC-320 AND AFTER.

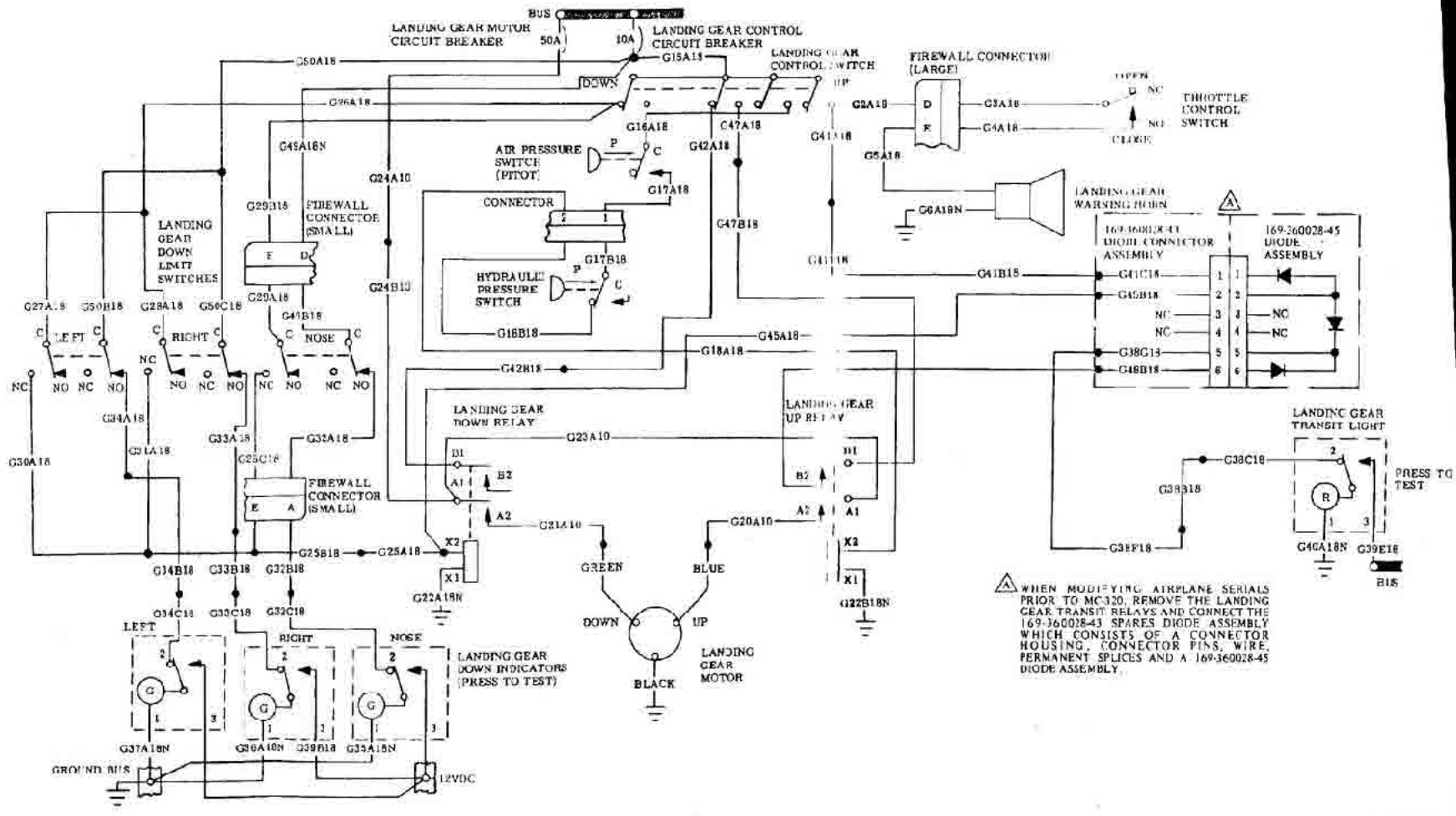
A24R-369-33



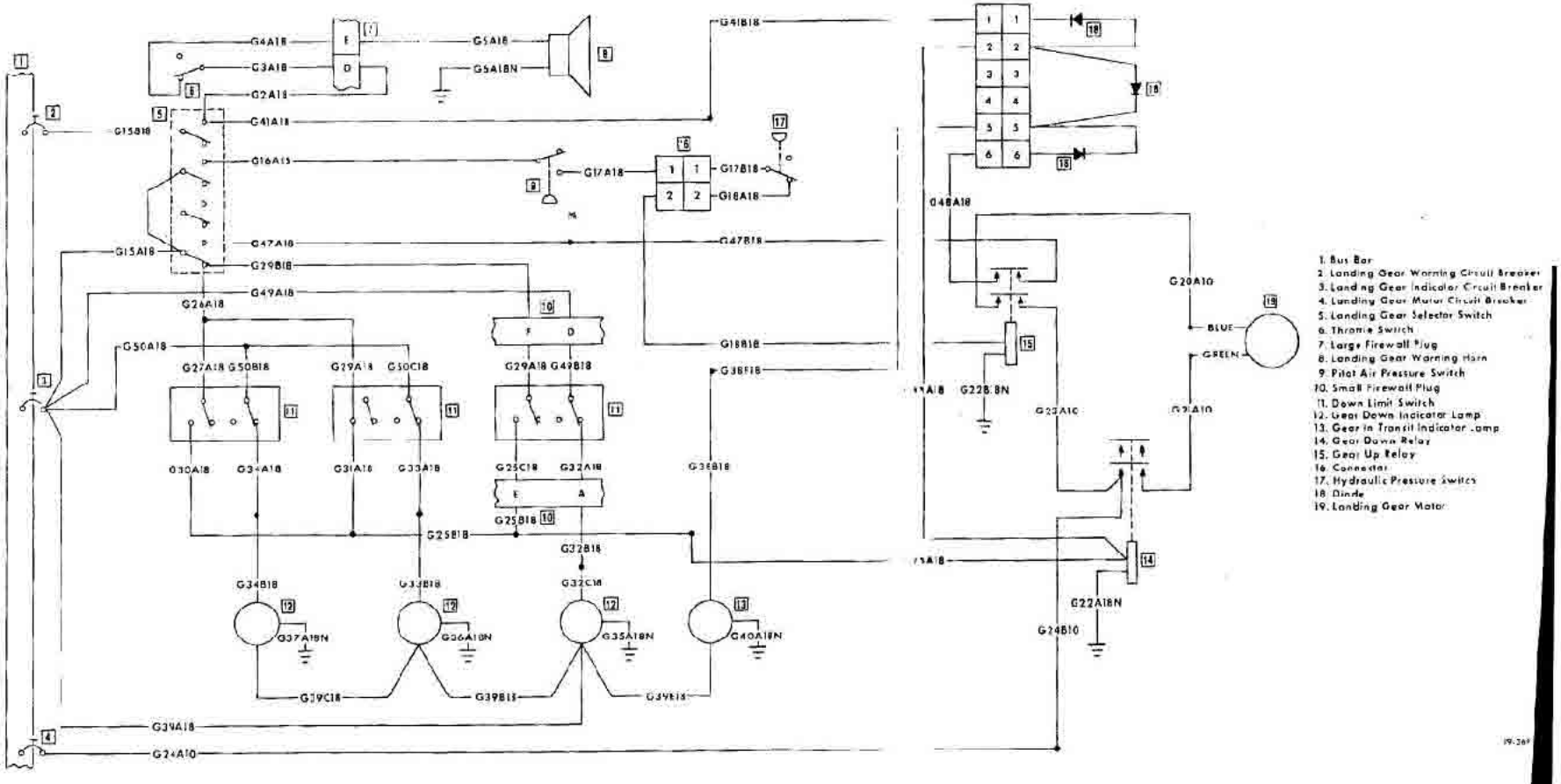
THE LANDING GEAR TRANSIT RELAYS MAY BE REPLACED WITH A DIODE ASSEMBLY. THIS MAY BE ACCOMPLISHED BY REMOVING THE RELAYS AND CONNECTING A 169-360028-43 SPARES DIODE ASSEMBLY AS SHOWN IN THE CIRCUIT FOR THE AIRPLANE SERIALS MC-320 AND AFTER.

A24R369-33A

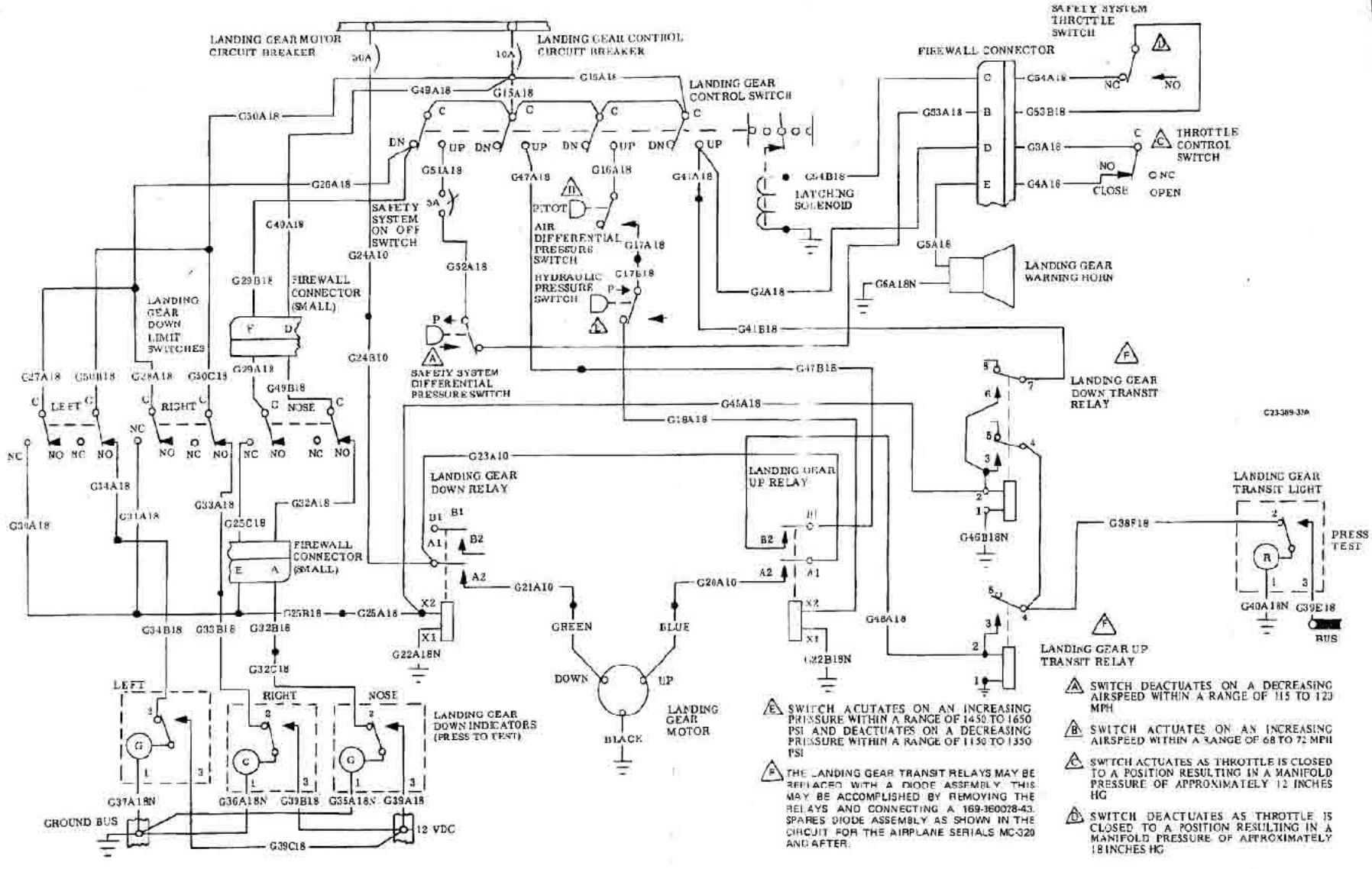
Retractable Landing Gear
MC 104 thru MC 319



Retractable Landing Gear
MC-320 thru MC-1970, MC-1972 thru MC-1979



Retractable Landing Gear
MC-1971, MC-1980 and after



(A) SWITCH DEACTUATES ON A DECREASING AIRSPEED WITHIN A RANGE OF 115 TO 120 MPH

(B) SWITCH ACTUATES ON AN INCREASING AIRSPEED WITHIN A RANGE OF 68 TO 72 MPH

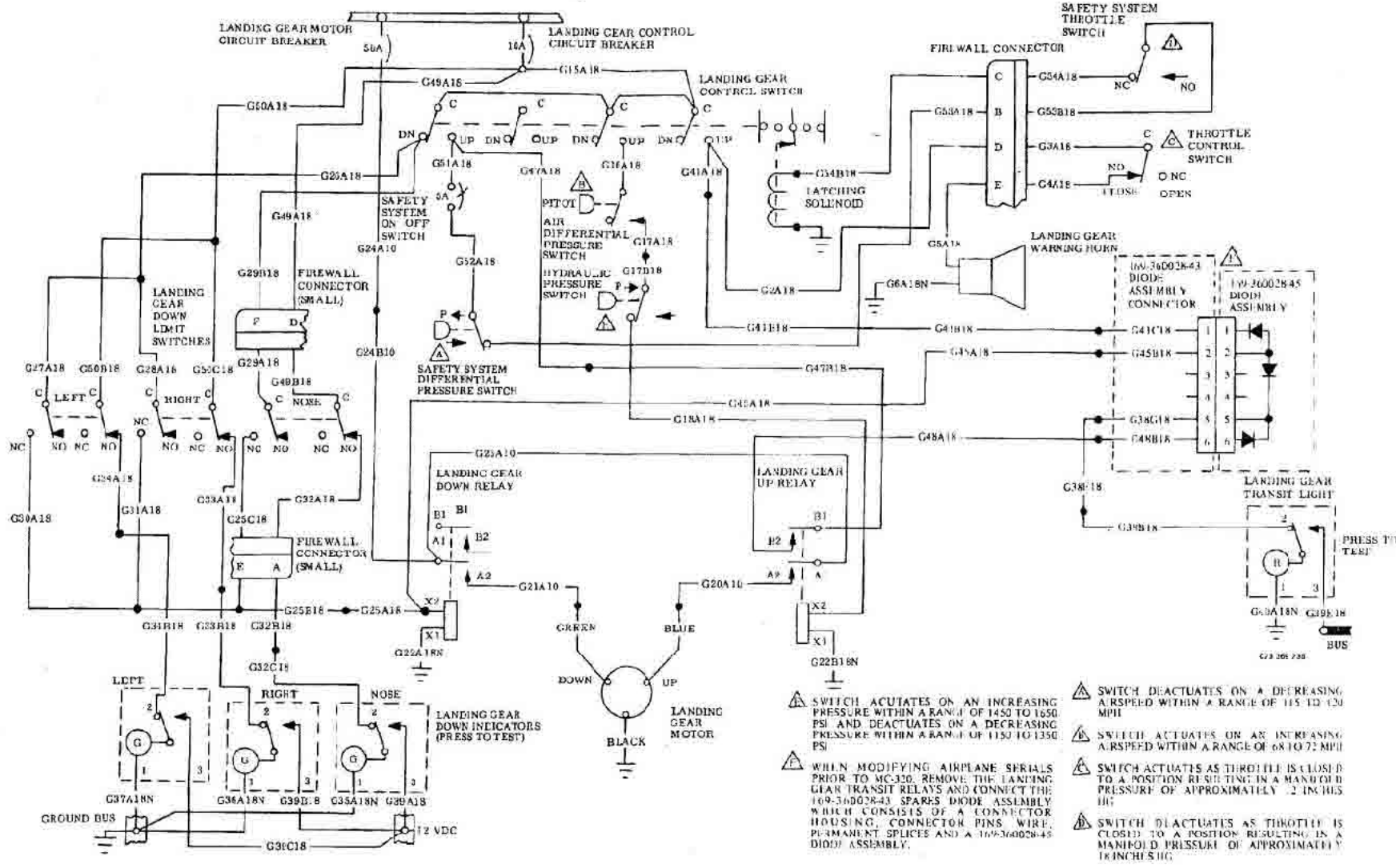
(C) SWITCH ACTUATES AS THROTTLE IS CLOSED TO A POSITION RESULTING IN A MANIFOLD PRESSURE OF APPROXIMATELY 12 INCHES HG

(D) SWITCH DEACTUATES AS THROTTLE IS CLOSED TO A POSITION RESULTING IN A MANIFOLD PRESSURE OF APPROXIMATELY 18 INCHES HG

(E) SWITCH ACTUATES ON AN INCREASING PRESSURE WITHIN A RANGE OF 1450 TO 1650 PSI AND DEACTUATES ON A DECREASING PRESSURE WITHIN A RANGE OF 1150 TO 1350 PSI

(F) THE LANDING GEAR TRANSIT RELAYS MAY BE REPLACED WITH A DIODE ASSEMBLY. THIS MAY BE ACCOMPLISHED BY REMOVING THE RELAYS AND CONNECTING A 169-360028-43 SPARES DIODE ASSEMBLY AS SHOWN IN THE CIRCUIT FOR THE AIRPLANE SERIALS MC-320 AND AFTER.

Retractable Landing Gear
(With Optional Safety System)
MC-2 thru MC-319



⚠ SWITCH ACTUATES ON AN INCREASING PRESSURE WITHIN A RANGE OF 1450 TO 1650 PSI AND DEACTUATES ON A DECREASING PRESSURE WITHIN A RANGE OF 1150 TO 1350 PSI

⚠ WHEN MODIFYING AIRPLANE SERIALS PRIOR TO MC-320, REMOVE THE LANDING GEAR TRANSIT RELAYS AND CONNECT THE 169-36002843 SPARKS DIODE ASSEMBLY WHICH CONSISTS OF A CONNECTOR HOUSING, CONNECTOR PINS, WIRE, PERMANENT SPLICES AND A 169-36002845 DIODE ASSEMBLY.

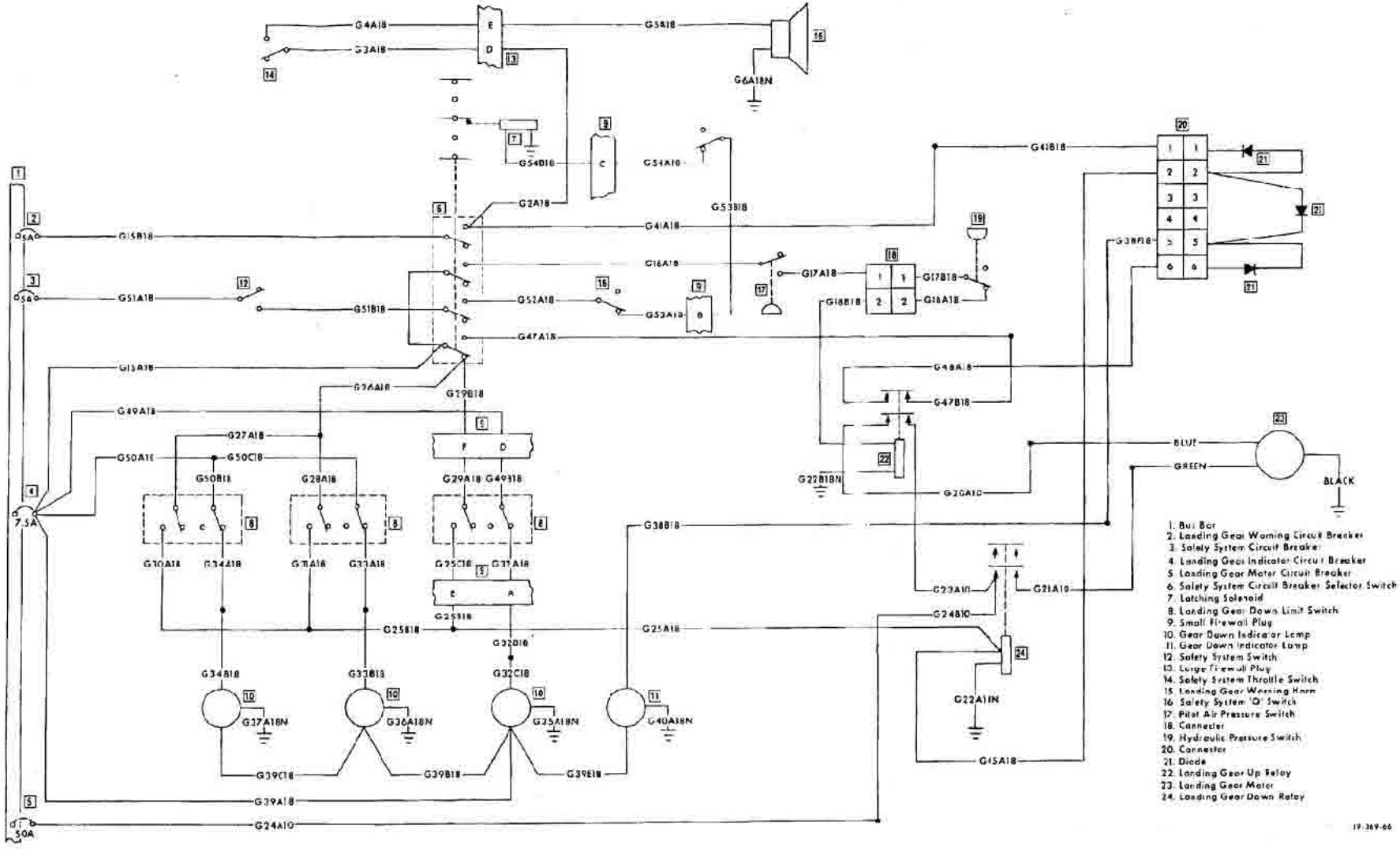
⚠ SWITCH DEACTUATES ON A DECREASING AIRSPEED WITHIN A RANGE OF 115 TO 120 MPH

⚠ SWITCH ACTUATES ON AN INCREASING AIRSPEED WITHIN A RANGE OF 68 TO 72 MPH

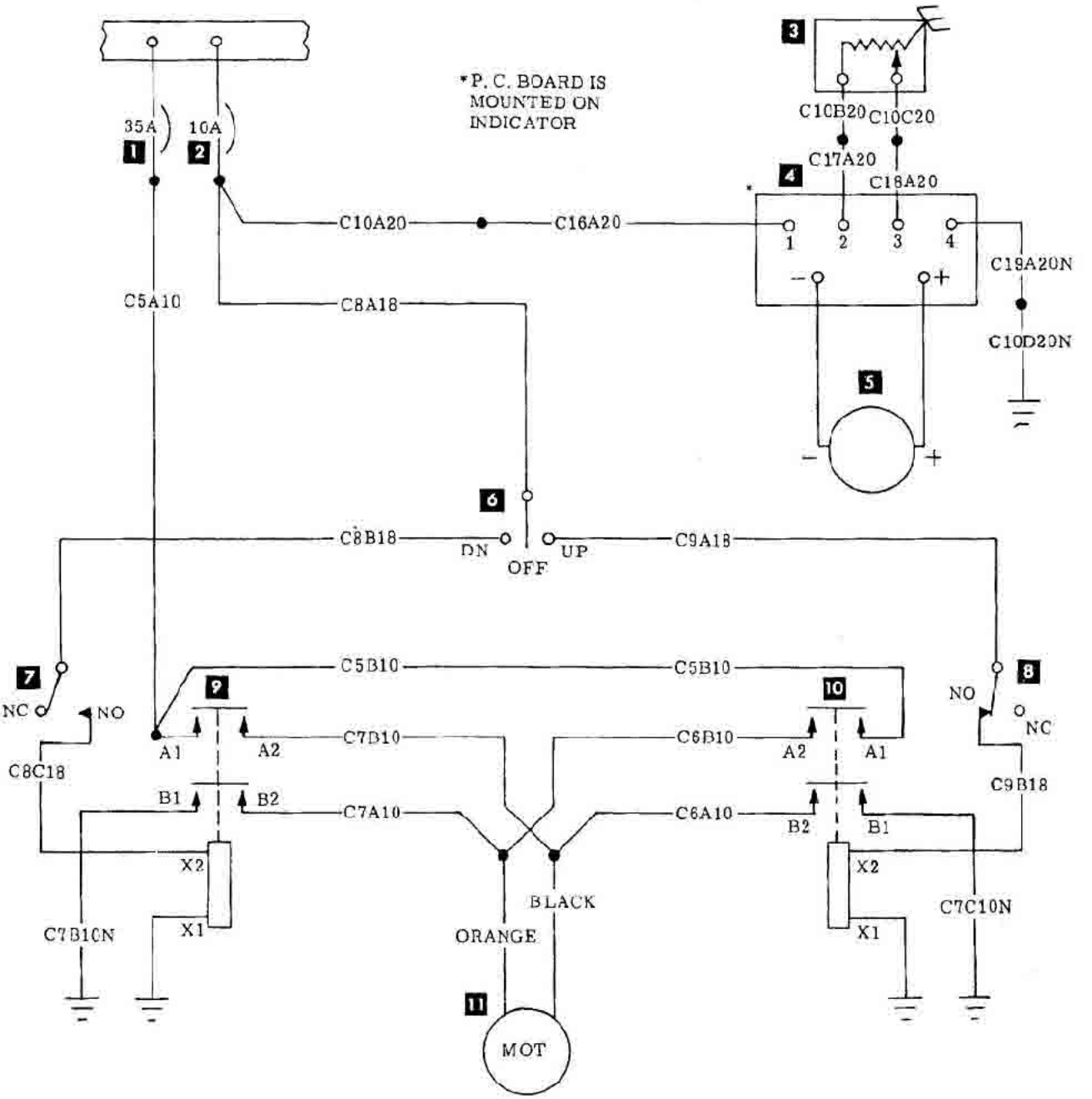
⚠ SWITCH ACTUATES AS THROTTLE IS CLOSED TO A POSITION RESULTING IN A MANIFOLD PRESSURE OF APPROXIMATELY 12 INCHES HG

⚠ SWITCH DEACTUATES AS THROTTLE IS CLOSED TO A POSITION RESULTING IN A MANIFOLD PRESSURE OF APPROXIMATELY 16 INCHES HG

Retractable Landing Gear
(With Optional Safety System)
MC-320 thru MC-1970, MC-1972 thru MC-1979



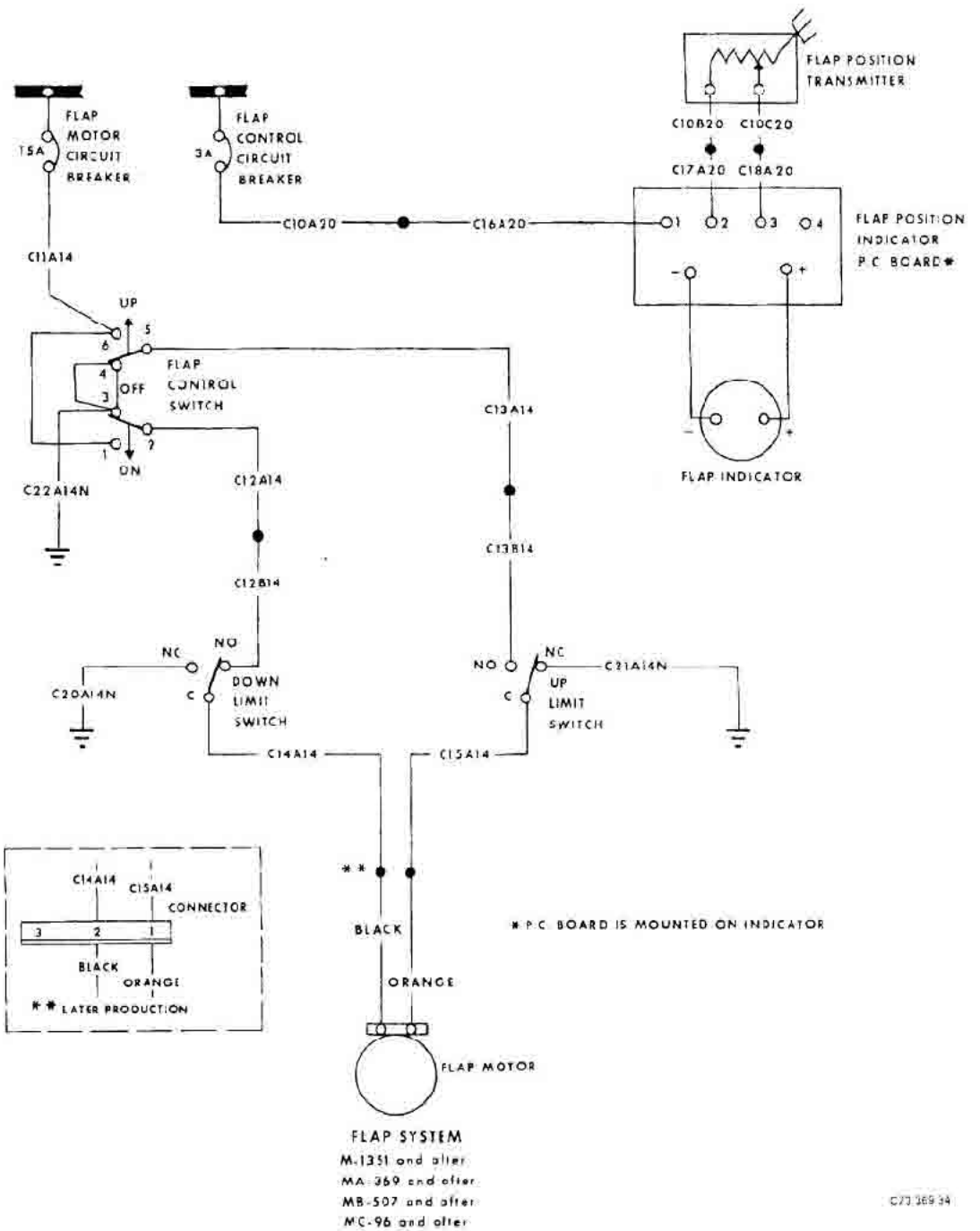
Retractable Landing Gear
(With Optional Safety System)
MC-1971, MC-1980 and after



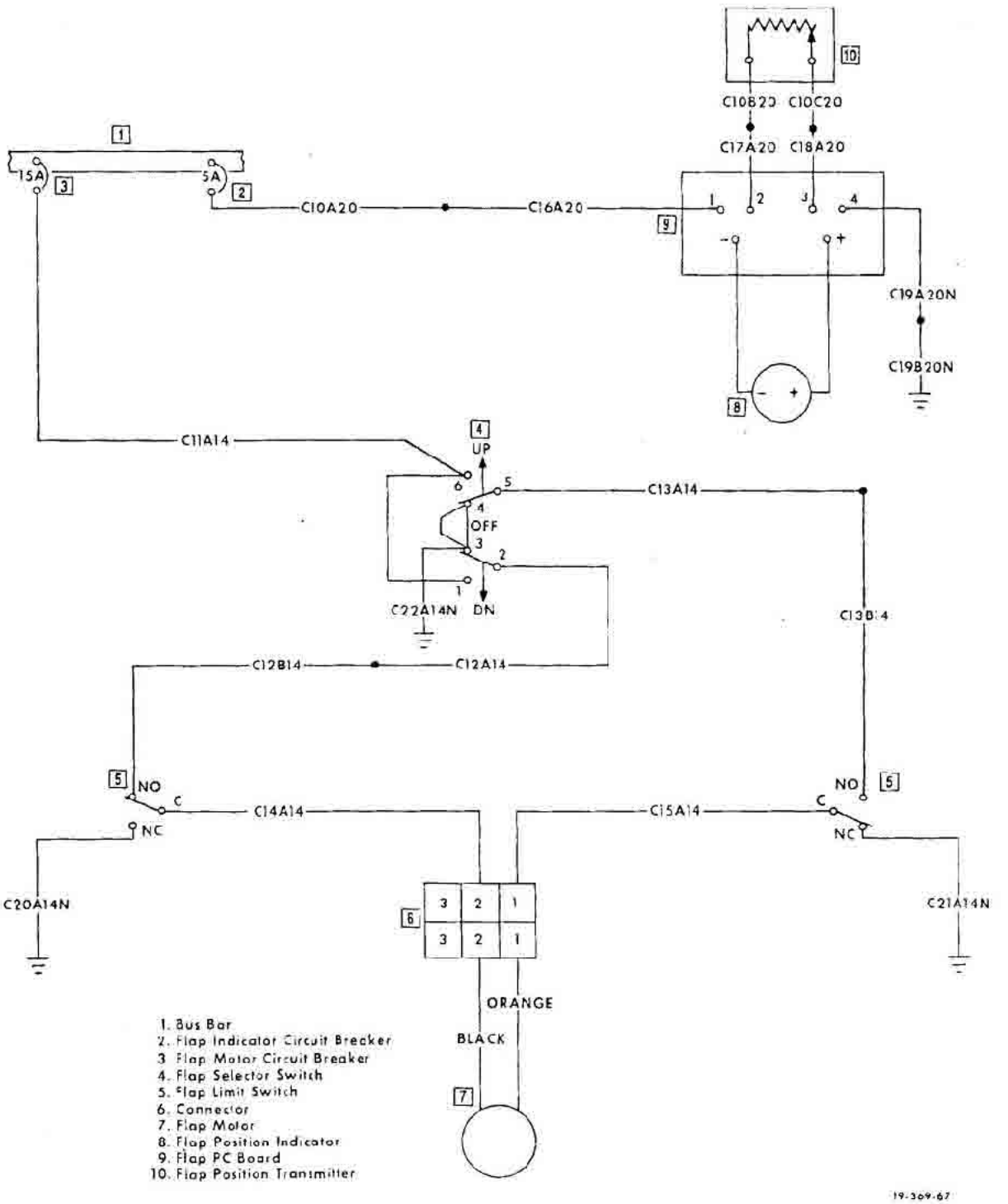
1. Flap Motor Circuit Breaker
2. Flap Control Circuit Breaker
3. Flap Position Transmitter
4. Flap Position Indicator P. C. Board
5. Flap Indicator
6. Flap Control Switch
7. Down Limit Switch
8. Up Limit Switch
9. Flap Down Relay
10. Flap Up Relay
11. Flap Motor

Flaps
M-1278 thru M-1350
MA-362 thru MA-368
MB-452 thru MB-506
MC-2 thru MC-95

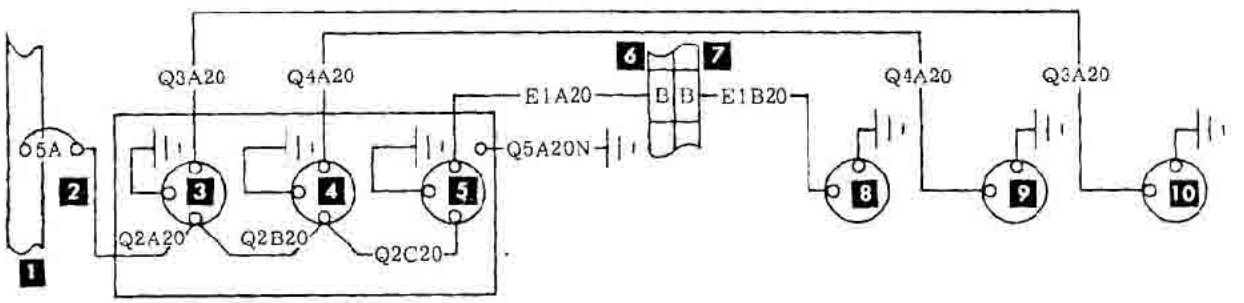
23 369 15



Flaps
M-1351 thru M-1970, M-1972 thru M-1979
MB-507 thru MB-865
MC-96 thru MC-532, MC-534 thru MC-536



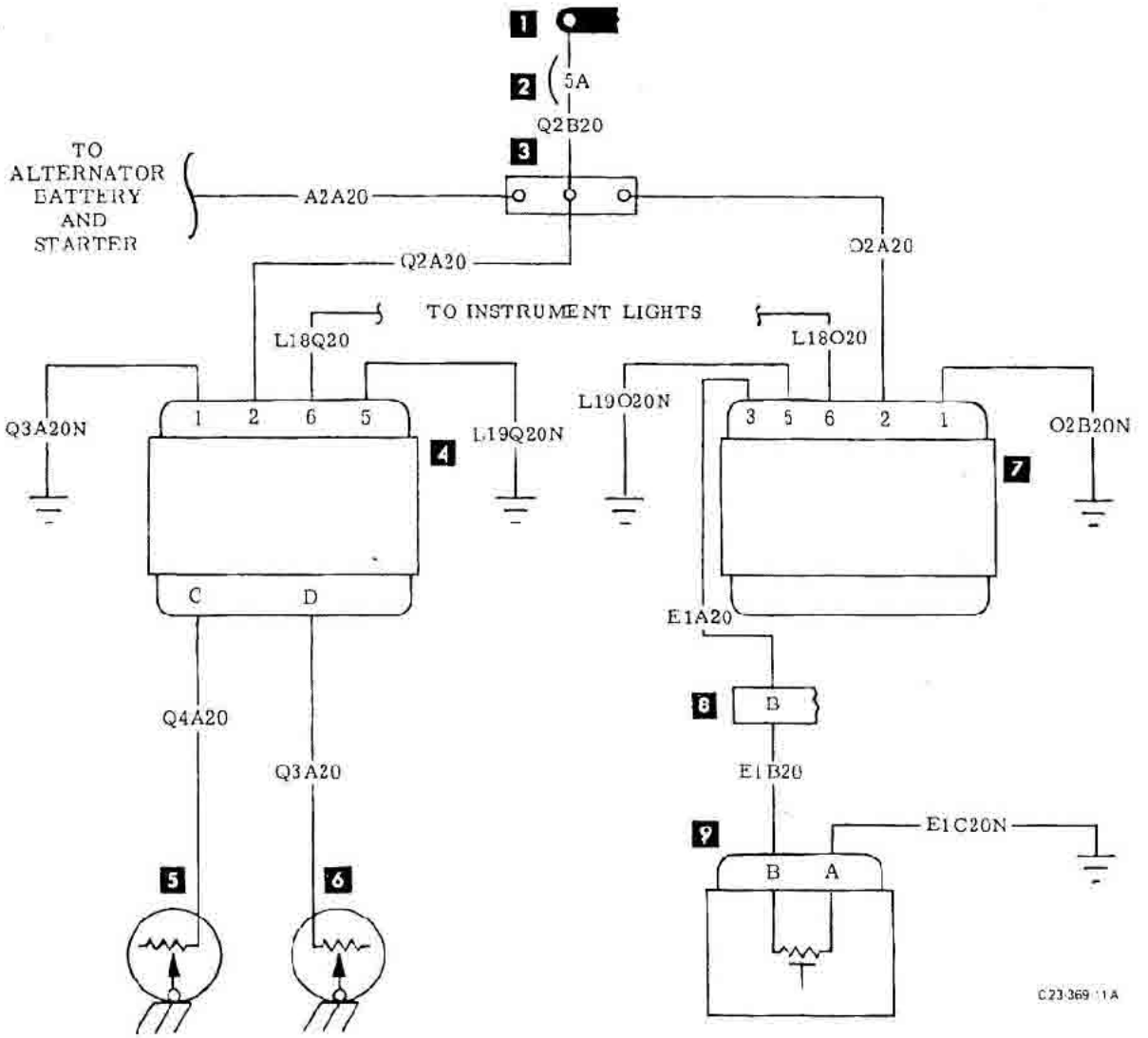
Flaps
M-1971, M-1980 and after
MB-866 and after
MC-533, MC-537 and after



1. Bus Bar
2. Circuit Breaker (5 amp)
3. Left Fuel Quantity Gage
4. Right Fuel Quantity Gage
5. Oil Temperature Gage
6. Firewall Receptacle (Small)
7. Firewall Plug (Small)
8. Oil Temperature Transmitter
9. Right Fuel Quantity Transmitter
10. Left Fuel Quantity Transmitter

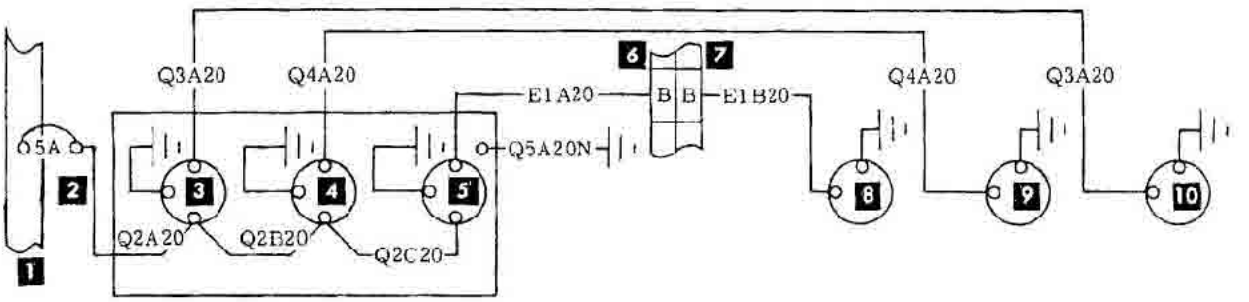
23-369-16

Fuel Quantity and Oil Temperature
(M-555 thru M-1284, MA-1 thru MA-363,
MB-1 thru MB-480)



1. Bus
2. Circuit Breaker
3. Terminal Board
4. Fuel Quantity Indicator -P5
5. Right Fuel Quantity Transmitter
6. Left Fuel Quantity Transmitter
7. Oil Temperature Indicator -P19
8. Firewall Connector (Small)
9. Oil Temperature Transmitter -P119

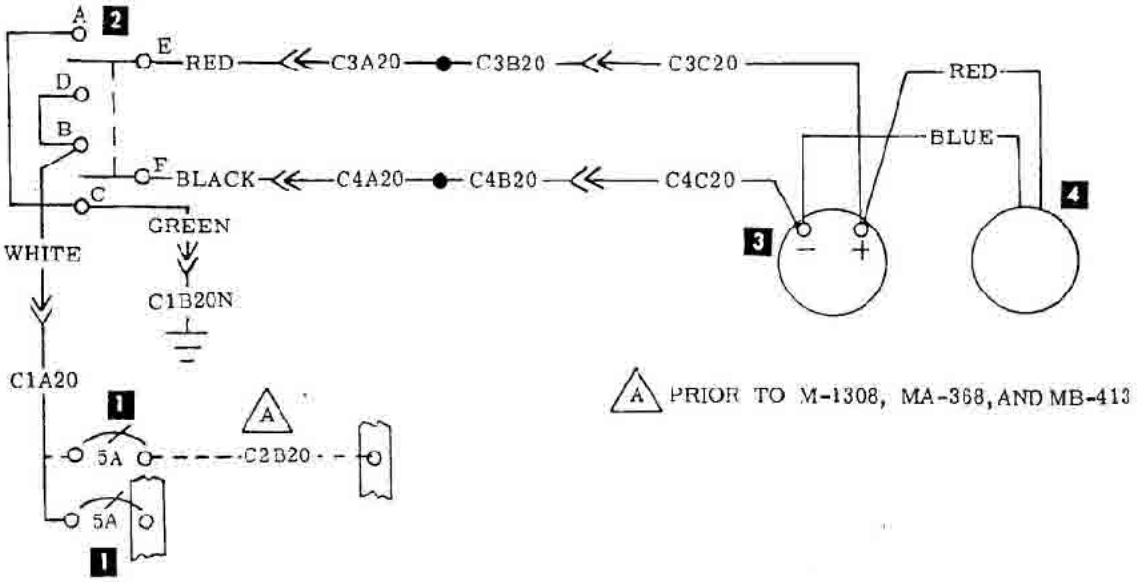
Fuel Quantity and Oil Temperature
M-1285 thru M-1375
MA-364 thru MA-368
MB-481 thru MB-530
MC-2 thru MC-102



1. Bus Bar
2. Circuit Breaker (5 amp)
3. Left Fuel Quantity Gage
4. Right Fuel Quantity Gage
5. Oil Temperature Gage
6. Firewall Receptacle (Small)
7. Firewall Plug (Small)
8. Oil Temperature Transmitter
9. Right Fuel Quantity Transmitter
10. Left Fuel Quantity Transmitter

23-369-16

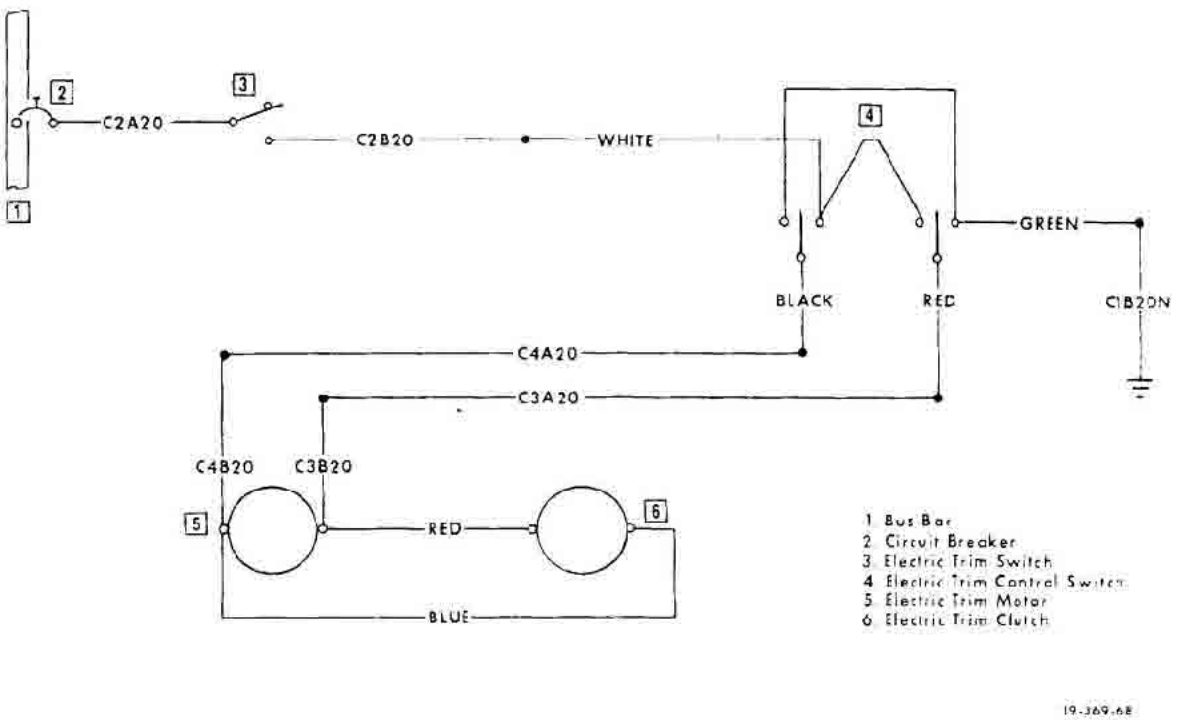
Fuel Quantity and Oil Temperature
M-1376 and after
MB-531 and after
MC-103 and after



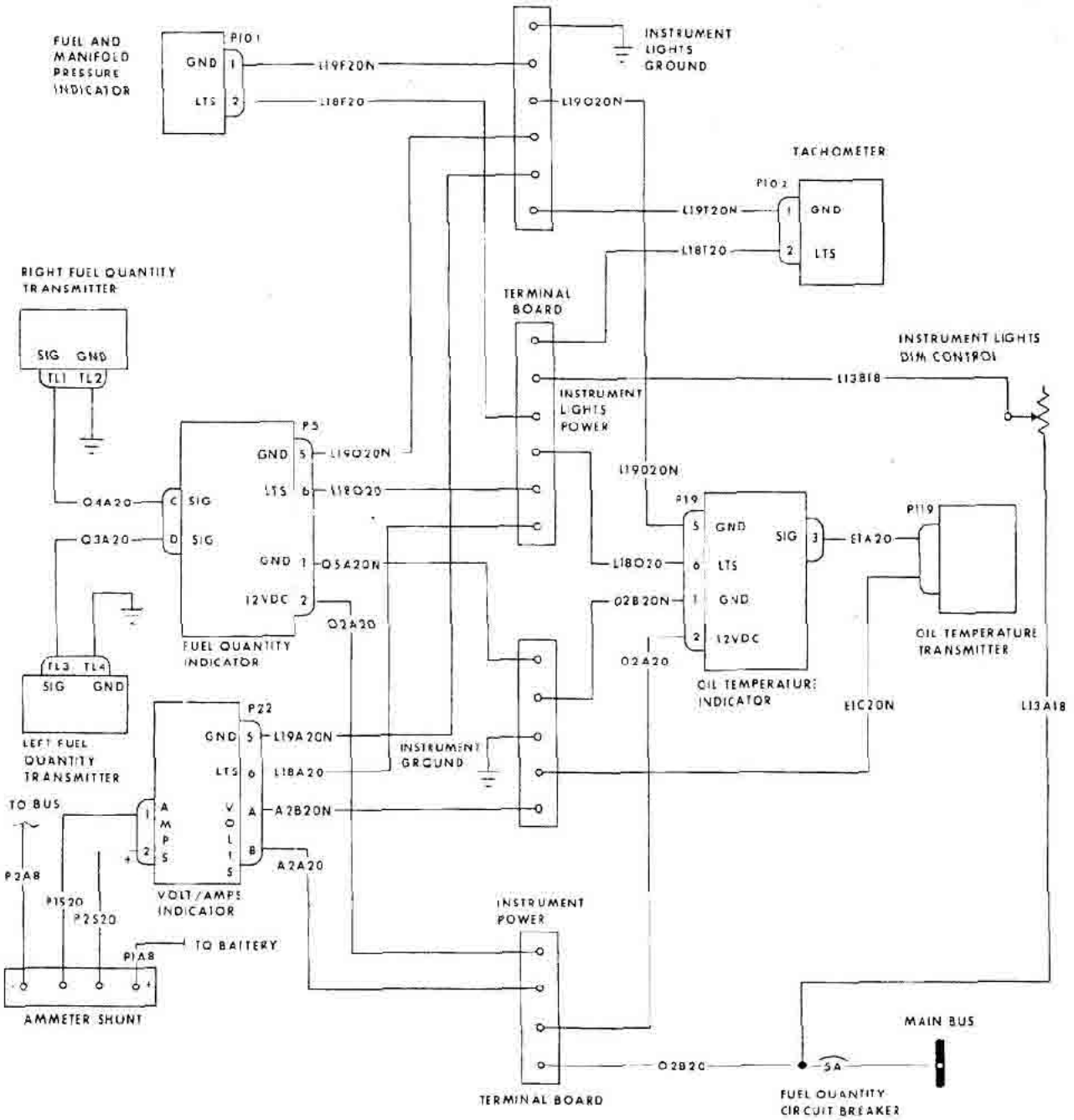
1. Circuit Breaker - 5A
2. Trim Control Switch
3. Trim Motor
4. Clutch

23-369-17A

Electric Trim
M-1069 thru M-1970, M-1972 thru M-1979
MA-273 thru MA-368
MB-289 thru MB-865
MC-2 thru MC-532, MC-534 thru MC-536



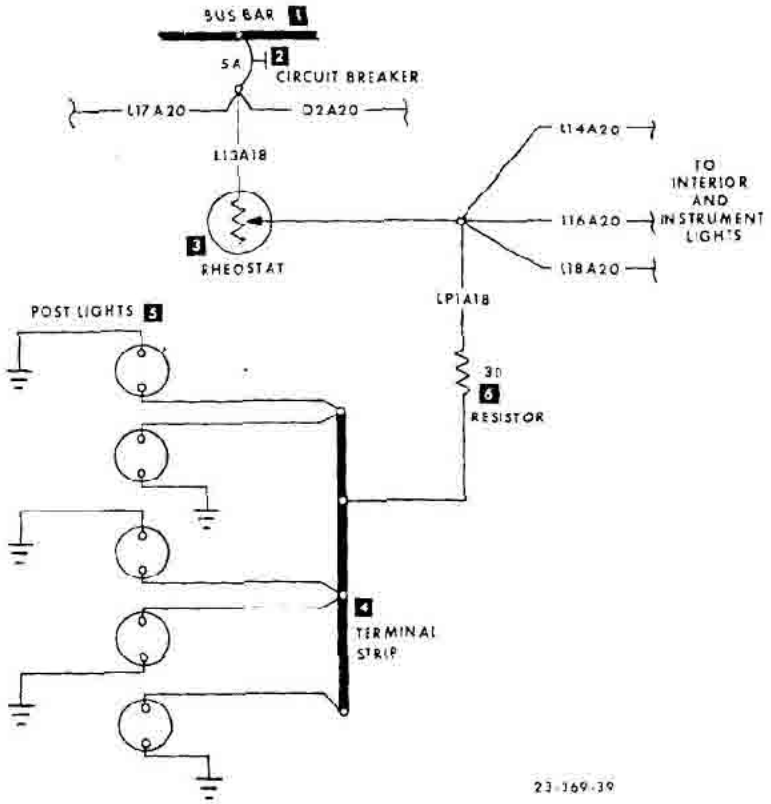
Electric Trim (Optional)
M-1971, M-1980 and after
MB-866 and after
MC-533, MC-537 and after



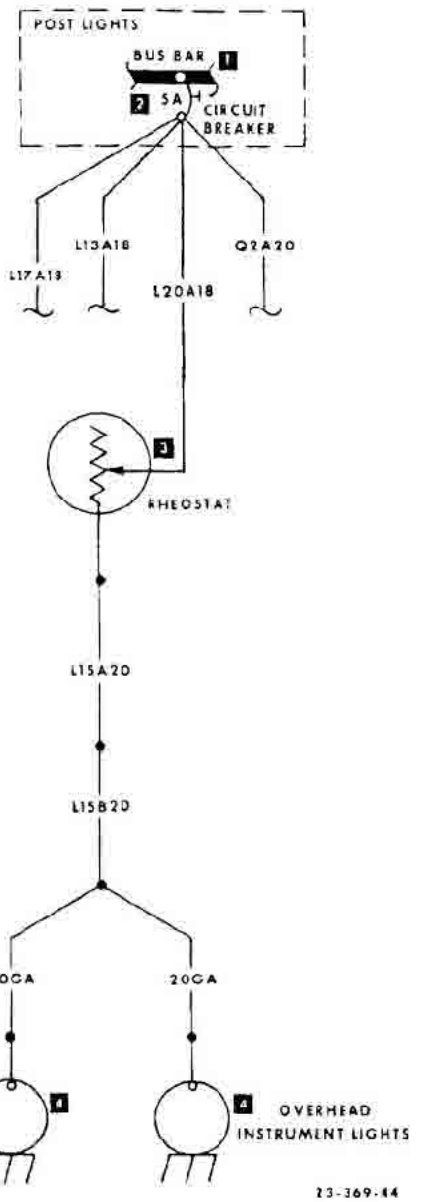
Vertical Instrument Interconnect
M-1285 thru M-1375
MA-364 thru MA-368
MB-481 thru MB-530
MC-2 thru MC-102

C23369-10

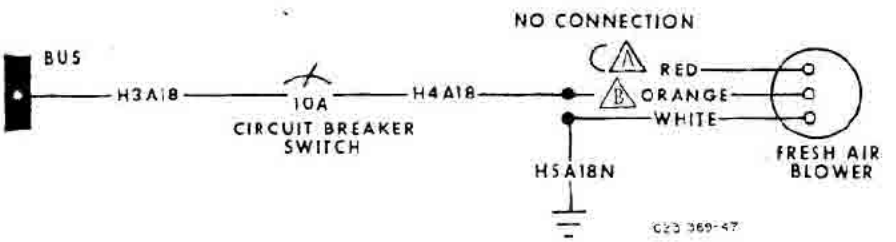
F5



Post Lights (Optional)
M-1302 and after
MB-494 and after
MC-70 and after

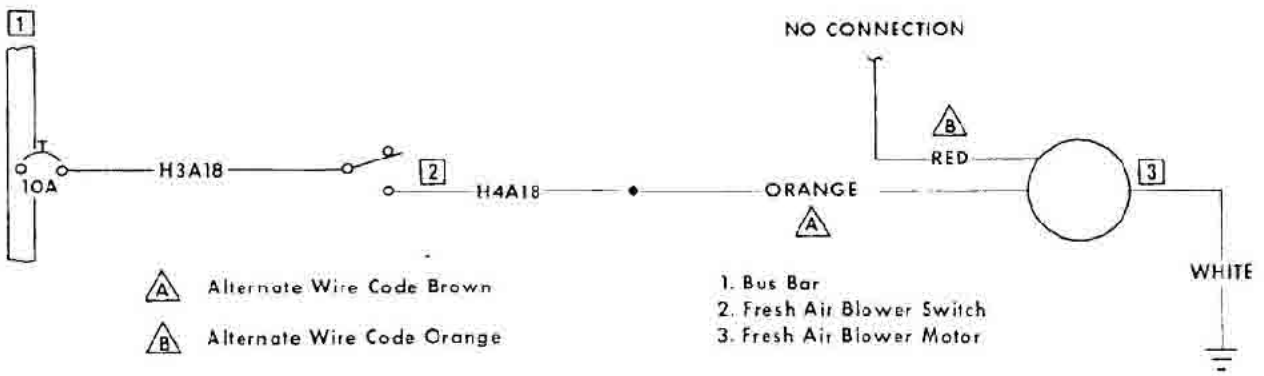


Overhead Instrument and Map Lights
M-1379 and after
MB-536 and after
MC-104 and after



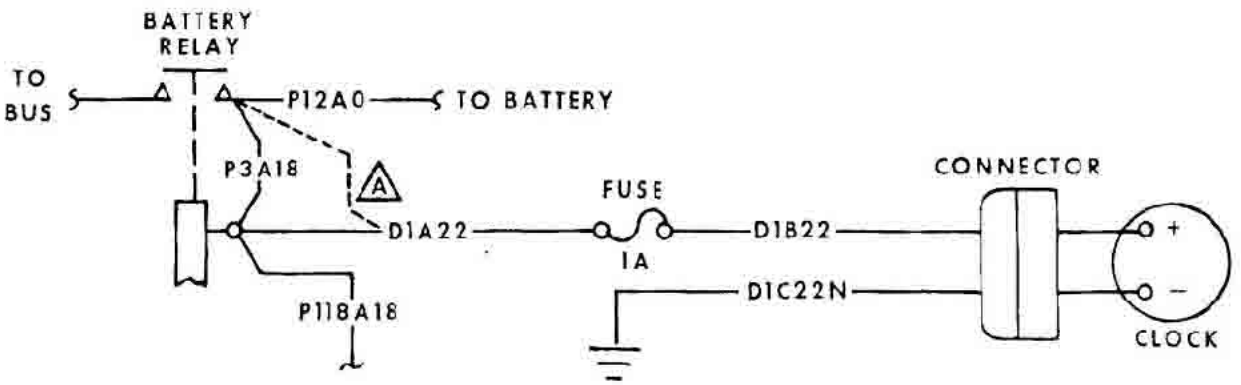
ALTERNATE WIRE CODES

A ORANGE
B BROWN



19-369-69

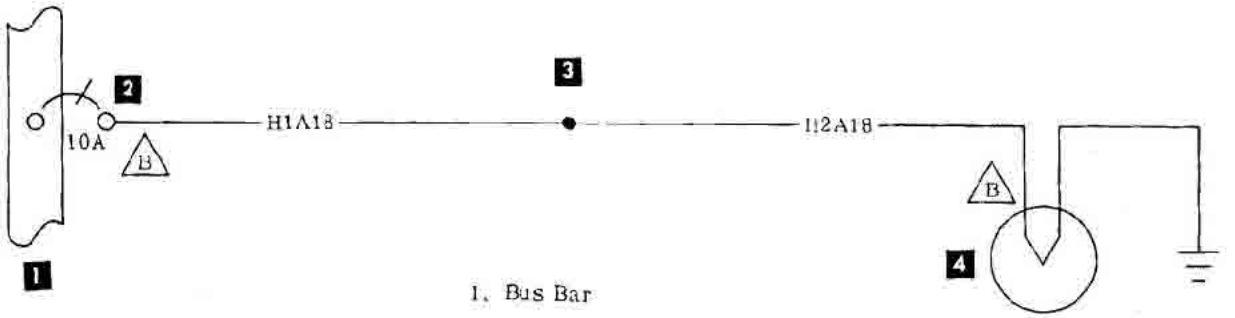
Fresh Air Blower (Optional)
M-1971, M-1980 and after
MB-866 and after
MC-533, MC-537 and after



A This Configuration Used On M-1971, M-1980 And After; MB-866 And After And MC-533, MC-537 And After

23-369-45

Electric Clock
M-1894 and after
MB-821 and after
MC-462 and after

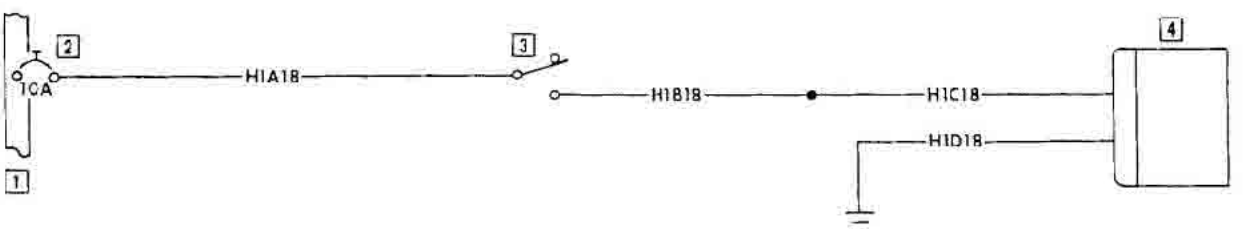


1. Bus Bar
2. Circuit Breaker
3. Permanent Splice
4. Pitot Heater

B Ends of wires are taped when heated pitot tube is not installed

23-369-23

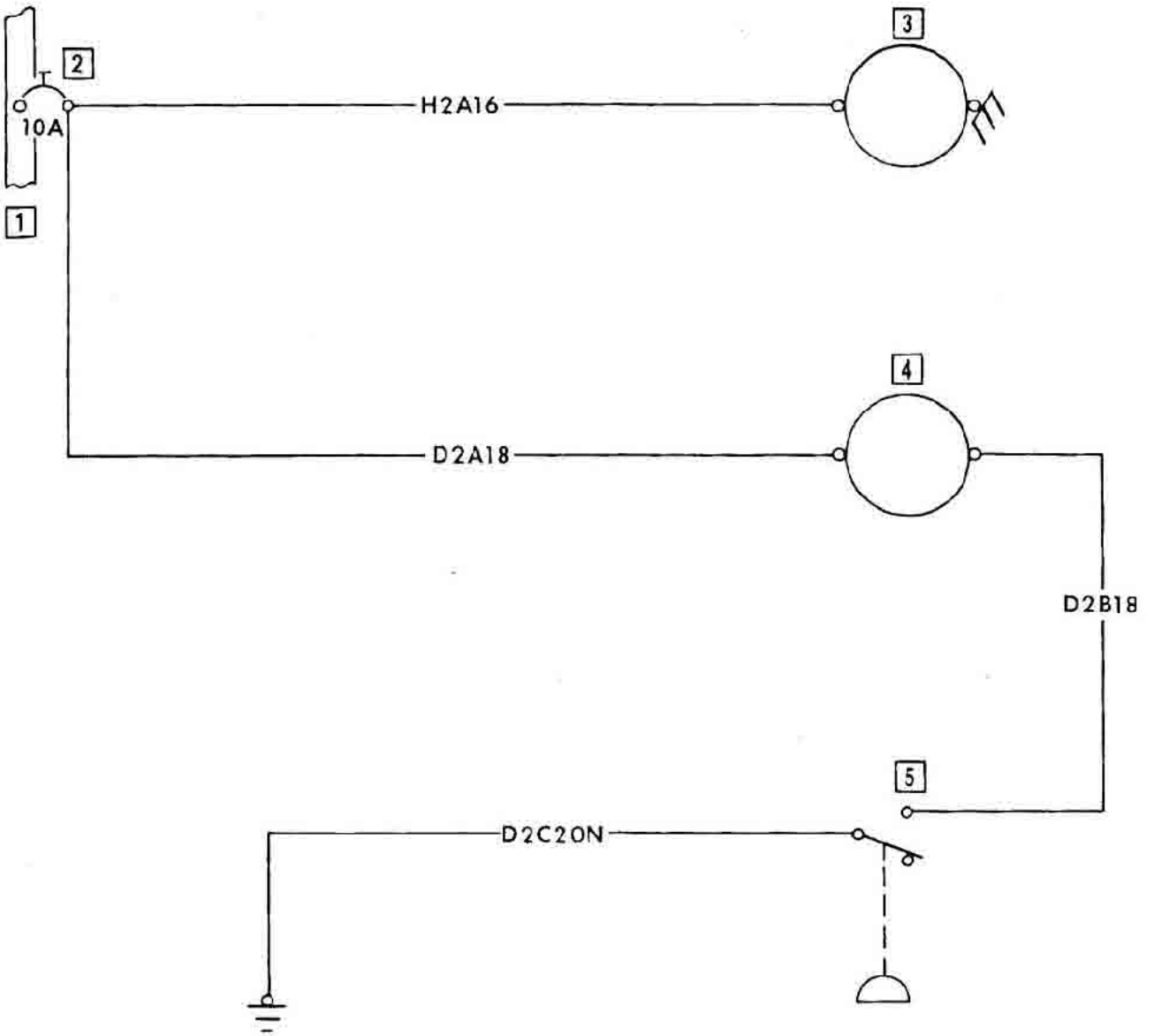
Pitot Heat
M-555 thru M-1970, M-1972 thru M-1979
MA-1 thru MA-368
MB-1 thru MB-865
MC-1 thru MC-532, MC-534 thru MC-536



1. Bus Bar
2. Pitot Heat Circuit Breaker
3. Pitot Heat Switch
4. Heated Pitot Tube

19-369-70

Pitot Heat (Optional)
M-1971, M-1980 and after
MB-866 and after
MC-533, MC-537 and after



1. Bus Bar
2. Cigar Lighter Circuit Breaker
3. Cigar Lighter
4. Flight Hour Meter
5. Flight Hour Meter Pressure Switch

19-369-71

Cigar Lighter and Flight Hour Meter
M-1971, M-1980 and after
MB-866 and after
MC-533, MC-537 and after

5

PERIODIC INSPECTION SCHEDULE

SECTION V

PERIODIC INSPECTION SCHEDULE

NOTE

This inspection procedure meets the intent of FAR 91.169 and Part 43, Appendix D.

The owner or operator is primarily responsible for maintaining the airplane in an airworthy condition, including compliance with all applicable Airworthiness Directives as specified in Part 39 of the Federal Aviation Regulations. It is further the responsibility of the owner or operator to ensure that the airplane is inspected in conformity with the requirements of Parts 43 and 91 of the Federal Aviation Regulations. Beech Aircraft Corporation has prepared this inspection guide to assist the owner or operator in meeting the foregoing responsibilities. This inspection guide is not intended to be all-inclusive, for no such guide can replace the good judgment of a certified airframe and power plant mechanic in the performance of his duties. As the one primarily responsible for the airworthiness of the airplane, the owner or operator should select only qualified personnel to maintain the airplane.

The time periods for the inspections noted in this schedule are based on normal usage under average environmental conditions. Airplanes operated in extremely humid tropics, or in exceptionally cold, damp climates, etc., may need more frequent inspections for wear, corrosion, lubrication, and/or lack of maintenance. Under these adverse conditions, perform periodic inspections in compliance with this guide at more frequent intervals until the owner or operator can set his own inspection periods based on the contingencies of field experience. A 100-hour inspection MUST be accomplished within each 12-month period for compliance with the Federal Aviation Regulations. To the extent that the airplane is operated in excess of 100 hours per year, Beech Aircraft Corporation strongly recommends that the airplane be inspected at 100-hour intervals rather than annually. The 100-hour interval between performance of the procedures specified herein should NEVER be exceeded by more than 10 hours, and then only if the additional time is required to reach a place where the inspection can be satisfactorily accomplished.

While this guide may be used as an outline, detailed information of the many systems and components in the airplane will be found in the various sections of this shop manual and the pertinent vendor publications. It is also recommended that reference be made to the applicable Maintenance Handbooks, Service Instructions, Service Letters, Service Bulletins, Installation Instructions, and vendor's specifications for torque values, clearances, settings, tolerances, and other requirements. It should further be verified that all interior and exterior placards are legible and in place during the inspection. In the final analysis, it is the responsibility of the owner or operator to ensure that the airframe and power plant mechanic inspecting the airplane has access to the previously noted documents as well as to this inspection guide.

NOTE

In addition to the inspections prescribed by this schedule, the altimeter instrument and static system and all ATC transponders MUST be tested and inspected at 24-month intervals in compliance with the requirements specified in FAR Parts 91.170 and 91.177 under Title 14 of the Code of Federal Regulations.

Complete 100-Hour Inspections are available under P/N 130234D or subsequent revisions to facilitate inspection.

A. OPERATIONAL INSPECTION	MECH	INSP
1. Generator/Alternator - Check for condition, attachment, and proper operation.		
2. Starter - Check for condition, mounting, and proper operation.		
3. Magnetos - Check for condition, mounting, and proper operation.		
4. Engine instruments - Check for condition, mounting, and proper operation.		
5. Flight instruments - Check for condition, mounting, and proper operation.		
6. Fuel quantity gages - Check for condition, mounting, and proper operation.		
7. Ammeter - Check for condition, mounting, and proper operation.		
8. Idle RPM and mixture - With engine running, check for proper mixture and correct RPM. With engine off check controls for freedom of movement and full travel		
9. All engine controls - With engine running, check for freedom of movement and proper travel		
10. Power checks - Check engine for proper output in accordance with engine manufacturer's manuals and cautions on proper reductions.		
11. Fuel boost pump - Check for proper operation and output.		
12. Brakes - Check for proper adjustment, ease of operation, and proper release of parking brake.		
13. Fuel tank selector - Check for proper operation and freedom of movement.		
14. Radio - Check condition, operation, and security of mounting.		
15. Pitot heat - Check amperage drawn on ammeter and proper heating of unit.		
16. Ignition switch - At idle RPM, rotate the ignition switch through the OFF position to the extreme limit of its travel; if the engine stops firing the switch is normal. If the engine continues to run with the switch held in the past OFF position refer to Bendix Service Bulletin No. 583 dated February, 1976.		
17. Idle cut-off - Check for proper operation.		
18. Flaps - Check for noisy or erratic operation and full travel.		
19. All lights - Check for condition, operation, attachment, cracked or broken lenses.		

A. OPERATIONAL INSPECTION (Cont'd)	MECH	INSP
20. Circuit breakers - Check for proper operation.		
21. Emergency locator transmitter - Check for proper operation. **NOTE** Tune radio to 121.5 MHz on VHF or 243 MHz on UHF, then turn ELT switch to ON and monitor for one signal. Turn ELT switch OFF, then place in ARM position. Tests MUST be conducted only in the first five minutes of any hour.		
B. POWER PLANT	**MECH**	**INSP**
1. Fuel system, screens and strainers - Check for condition, security, and lines for deterioration and leaks; screens and strainers for contamination.		
2. Intake filter - Check for condition, cleanliness and corrosion.		
3. Spark plugs - Clean, test, and regap spark plugs.		
4. Plumbing - Inspect plumbing and associated equipment for condition and security, leakage and chafing.		
5. Propeller - Check for condition and security; gouges, nicks, or corrosion and refurbish as outlined in the applicable propeller manual. Check the tip of the blades for evidence of lightning strikes, check the area of entering or leaving the blade for hardness. The inside and outside shank area should be checked for arcing. In all cases of lightning strikes the thrust bearings should be replaced, soft blades rejected, and all steel parts demagnetized.		
6. Spinner and brackets - Check for condition and security, corrosion and evidence of cracking.		
7. Cowling - Check for condition, security, and adjustment of latches. Remove upper cowling and clean. Inspect for cracks and corrosion.		
8. Magneto and breaker points - Check magneto to engine timing; breaker points for pitting and proper gap.		
9. Engine cylinders and baffles - Check cylinders for obvious leaks, security, and condition; baffles for condition, security and cracking.		
10. Exhaust system - Check for condition, security, cracks, and leaks.		
11. Induction system and alternate air - Check for blockage, security, and operation. Check for signs of cracking.		
12. Alternate air door and hinge - Check for condition, security, and operation.		
13. Engine accessories - Check for condition, security, and oil leaks.		

B. POWER PLANT (Cont'd)	MECH	INSP
14. Engine mounts - Check for condition and security. Check for signs of cracking.		
15. Generator/Alternator - Check for condition, security, proper operation, and belts for condition and tension.		
16. Oil cooler, lines and fittings - Check for condition, security, chafing, and leaks.		
17. Oil suction screen and sump drains - Clean screen and check for obstructions.		
18. Heating and ventilation system - Check for condition, security, and obstructions. Check for leakage, cracking and burn out.		
19. Change oil, and filter (if applicable).		
20. Control linkages - Check for condition and wear at all attach points. Check for proper lubrication and excessive free play.		
21. Ignition harness - Check for condition, security, fraying, and chafing.		
22. All drains and plugs - Check for condition, security, and obstructions.		
23. Electrical wiring and equipment - Check for condition, security, and signs of chafing and fraying.		
24. Carburetor heat - Check for condition and operation.		
25. Propeller governor - Check for leaks, control arm security, and proper operation.		
26. Propeller hub - Check for signs of cracks.		
27. Injector fuel nozzles - Clean and check for nozzle flow and leakage.		
28. Crankcase breather line - Check for obstructions and security		

C. CABIN SECTION	MECH	INSP
1. Skin - Check for deformation and obvious damage Check for loose or missing rivets and corrosion		
2. Structure - Check for cracks and deformation. Check for loose or missing rivets, concealed damage and corrosion.		
3. Cables and pulleys Check for tension and condition: pulleys and brackets for condition and security Check for corrosion and fraying of cables.		
4. Electrical trim system (if installed) - Check for condition, security, and operation.		

C. CABIN SECTION (Cont'd)	MECH	INSP
5. Flap linkage - Check for condition, security, and wear at all points. Check for excessive freeplay.		
6. Electric flap system - Check for condition, security, and operation. Check for excessive freeplay.		
7. Boost pumps and fuel lines - Check for condition, security, and leaks; lines for signs of chafing.		
8. Brake system and reservoirs - Check for condition, security, and leaks; lines for signs of chafing. Check and fill reservoirs as needed.		
9. Rudder pedals and torque tube gears - Check for condition, freedom of movement, and security.		
10. Control column - Check for freedom of movement, condition, and security. Check for excessive freeplay.		
11. Cabin heat control and air vents - Check for condition and operation; vents for obstructions.		
12. Instrument plumbing and wiring - Check for condition, chafing, and security.		
13. Vacuum regulator filter - Check condition and clean as necessary. Check for security of attachment.		
14. Engine and propeller controls - Check for ease of operation.		
15. Windows, doors, seals, and locks - Check for condition, security, and operation. Check windows for crazing or cracking; seals for deterioration, deformation or cuts and locks for corrosion.		
16. Seats and seat belts - Check for condition, security, and operation. Check seat belts for fraying and inertia reels for condition and operation.		
17. Electrical wiring and equipment plumbing - Check for condition, security, signs of chafing, and fraying.		
18. Rudder/Aileron interconnect - Check for condition and security; cable tension, bungee spring stretch, and proper clearance. See Section III in the Shop Manual.		
19. Aileron centering system - Check for condition, security, and cable tension.		
20. Instrument air filter and suction relief valve filter - Check for condition, security, and cleanliness; clean or replace as necessary.		
21. Wing Spar - See Service Instructions No. 0824-135, Rev. 11 or subsequent.		
22. Wing attach points - Check for condition, security, and obvious damage. Refer to Service Instruction No. 0042-151, Rev. 1 or subsequent for further information on inspection.		

C. CABIN SECTION (Cont'd)	MECH	INSP
23. Static lines - Check for moisture and empty water trap (if applicable). Check for corrosion and leakage.		
24. Hydraulic lines - Check for condition, security, and leaks. Check for signs of chafing.		
25. Fuel selector valve - Check for proper engine shut down and freedom of movement. Adjust according to Service Instructions No. 0364-289, Rev. III or subsequent.		

D. WING SECTION	MECH L	MECH R	INSP
1. Skin - Check for deformation and obvious damage. Check for loose or missing rivets. If damage is found, check adjacent structure. Check for corrosion.			
2. Wing spar - See Service Instructions No. 0824-035, Rev. II or subsequent.			
3. Structure - Check for cracks and deformation. Check for loose or missing rivets. Check for corrosion.			
4. Access doors - Check for security. Check for loose, missing, or damaged attachments.			
5. Cables and bell cranks - Check for tension, condition, and signs of fraying; bell cranks for condition and security. Check for corrosion.			
6. Ailerons - Check for condition and security. Check for loose or missing rivets and freedom of movement. Check for excessive freeplay and corrosion.			
7. Aileron hinge bearings and brackets, push pull rods and rod ends - Check for condition; push pull rods for security; rod end for corrosion.			
8. Navigation lights - Check for condition, security, and operation. Check for cracked or broken lenses.			
9. Strobe lights (if installed) - Check for condition, security and operation. Check for cracked or broken lenses.			
10. Landing light - Check for condition, security, and operation. Check for cracked or broken lens.			
11. Taxi lights (if installed) - Check for condition, security, and operation. Check for cracked or broken lenses.			
12. Pitot tube - Check for security and obstructions.			
13. Fuel tanks, vents and caps - Check for condition, security, and leaks; vents for obstructions. Check for corrosion.			
14. Plumbing - Check for condition, chafing, and security. Check for leakage.			

D. WING SECTION (Cont'd)	MECH L	MECH R	INSP
15. Electrical wiring and equipment - Check for condition, chafing, and security.			
16. Flaps - Check for condition and security. Check for excessive freeplay and corrosion.			
17. Flap stops and bearings - Check for condition and wear.			
18. Flap actuator and limit switches - Check for condition, bind or chafing; limit switches for condition and security and/or linkage for freedom of movement.			
19. Flap position indicator transmitter - Check for security and operation.			
20. Stall warning vane - Check for operation.			

E. LANDING GEAR AND BRAKES	MECH L	MECH R	INSP
1. Wheels and tires - Check for condition and inflation. Check for wear, flat spots, and slippage.			
2. Brake lines, discs, and linings - Check for condition and security; lines for chafing and signs of leakage. Check for breaks and evidence of overheating.			
3. Landing gear strut and trunion bolts - Check for condition, security, and wear.			
4. Rubber shock absorbers - Check for condition and security, and deterioration.			
5. Gear attach fittings - Check for condition and security, and cracking.			
6. Nose gear centering spring and cables - Check for condition, security, and tension.			
7. Shimmy dampener - Check for condition.			
8. Nose gear steering linkage and boot - Check for condition and security.			
9. Axle and fork - Check for condition and security.			
10. Landing gear inspection after hard landing - Inspect the wings and landing gear in the area of the landing gear fitting. Check for signs of diagonal wrinkles in the fuel cell area (See "NOTE" in LANDING GEAR SYSTEM Section III in the Shop Manual). Inspect the pin retaining the nose wheel compression tube to the compression plate for deformity or separation. Refer to Section III of the Shop Manual for further instructions.			
11. Emergency operation (Retractable) - Check operation, condition, security and leakage.			

F. MAIN GEAR OPERATION (Retractable)	MECH L	MECH R	INSP
1. Position lights - Check for condition, security, and operation.			
2. Warning horn - Check for condition, security, and operation.			
3. Main actuating cylinders - Check for condition and security, noisy operation, leakage and rigging.			
4. Uplock cylinders - Check for condition, security, and leaks.			
5. Uplock linkage - Check for wear at attach points and security.			
6. Air pressure switch (68-72 mph) - Check for condition and operation.			
7. Hydraulic pressure switch - Check for condition, attachment, and operation.			
8. Gear hydraulic system (gear up) - Check for condition and leakage. Check for security and leakage of all hydraulic lines.			
9. Gear hydraulic system (gear down) - Check for condition and leakage.			
10. Down position tension - Check for proper tension.			
11. Downlimit switch - Check for condition, security, and rigging.			
12. Side arm hinge bushings, attach point hinge bolts, and bushings - Check for condition, security, and wear.			

G. NOSE GEAR OPERATION (Retractable)	MECH	INSP
1. Door - Check condition and operation.		
2. Position light - Check condition and operation.		
3. Main actuating cylinder - Check for condition and security. Check for noisy operation, leakage, and rigging.		
4. Downlock cylinder - Check for condition, security, and leaks.		
5. Downlock linkage - Check for wear at attach points and security.		
6. Downlimit switch - Check for condition, security, and rigging.		

H. REAR FUSELAGE AND EMPENNAGE	MECH	INSP
1. Skin - Check for deformation and obvious damage. Check for loose or missing rivets. If damage is found check adjacent structure. Check for corrosion.		
2. Structure - Check for cracks and deformation. Check for loose or missing rivets. Check for corrosion.		

H. REAR FUSELAGE AND EMPENNAGE (Cont'd)	MECH	INSP
3. Rotating beacon - Check beacon and mounting bracket for condition, security, and operation. Check for cracked or broken lens.		
4. Fixed step - Check for condition and security. Check for cracking.		
5. Antenna mounts - Check mounts and connections for condition and security. Check for cracking.		
6. Control surfaces - Check for condition and security. Check for loose or missing rivets. Check for freedom of movement. Check for corrosion and excessive freeplay.		
7. Trim tab system - Check for correct installation; hinge for condition and security; trim tab actuator for security and wear. Check for excessive freeplay.		
8. Cables and pulleys - Check for tension and condition; pulleys and brackets for condition and security. Check for corrosion, and fraying.		
9. Electrical wiring and equipment - Check for condition, chafing, and security. Check for fraying.		
10. Empennage attachment fittings - Check for condition and security. Check for corrosion.		
11. Battery - Check for condition, security, and fluid level; vents for obstructions and proper protrusion. Check for evidence of corrosion.		
12. Static ports - Check for obstruction and clean as necessary.		
13. Hydraulic pump and attachments (Retractable) - Check for condition, security, and reservoir for proper fluid level.		
14. Baggage door - Check for condition, security, and operation.		
I. GENERAL SERVICE ITEMS	**MECH**	**INSP**
1. Airplane cleaned and serviced.		
2. Airplane lubricated in accordance with Shop Manual Lubrication Chart.		

6

OVERHAUL AND REPLACEMENT SCHEDULE

SECTION VI

OVERHAUL, REPLACEMENT SCHEDULE

All overhaul and replacement times designated herein are but guidelines, NOT MANDATORY REQUIREMENTS. Climatic conditions, maintenance practices, and other factors may either extend or decrease these times. In the final analysis, adjustments in the overhaul and replacement periods should be determined by inspection findings and servicing experience. A TBO recommendation is in no way to be construed as a warranty or engine life proration basis. The TBO recommendation is based on the projected time for the most advantageous initial overhaul. The individual operator's experience may indicate a departure in either direction from the recommended TBO for the particular operation.

OVERHAUL AND REPLACEMENT SCHEDULE

All items not included in this listing are to be replaced or overhauled when necessary.

ITEM	*OVERHAUL OR REPLACE*
ELECTRIC FLAP	
Flap actuator motor	Replace when condition warrants
LANDING GEAR	
Hydraulic pump, motor assembly	Replace when condition warrants
Hydraulic pump motor brushes or commutator End head assembly	1000 hours
Brake assembly	Inspect at lining replacement
Shuttle valve assembly (brake)	1000 hours
Shuttle valve (gear retract system)	Replace when condition warrants
Main gear actuator	1000 hours or 2 years whichever occurs first
All hose	Replace when condition warrants
POWER PLANT	
Engines	
O-320-D2B (Model 23, Lycoming)	*2000 hours
O-320-E2B (Model 19, Lycoming) O-320-E2C	*2000 hours
O-320-E2C (Model 19A, B19, Lycoming)	*2000 hours
O-320-E3D (Model B19, Lycoming)	*2000 hours
O-360-A2G (Model B23, C23, Lycoming)	*2000 hours
O-360-A4J (Model C23, Lycoming)	*2000 hours
IO-360-A2A (Model 24, Lycoming)	*1600 hours
IO-360-A2B (Model 24, A24, Lycoming)	*1600 hours
IO-360-A1B (Model A24, A24R, Lycoming)	*1600 hours
IO-360-A1D (Model A24R, Lycoming)	*1600 hours
IO-360-A1B6 (Model B24R, Lycoming)	*1600 hours
IO-360-A1B6 (Model C24R, Lycoming)	*1600 hours
IO-346-A (Model A23, A23A, Continental)	*1500 hours

OVERHAUL AND REPLACEMENT SCHEDULE (Cont'd)

ITEM	*OVERHAUL OR REPLACE*
POWER PLANT (Cont'd)	
Propeller	
2D34C9/78FB-1.5 (McCauley)	1500 hours
1B235/BFA7762 (McCauley)	Replace when condition warrants
76EM8S5-0-60 (Sensenich)	500 hours
74DM6-0-58 (Sensenich)	1000 hours
74DM6S5-0-54 (Sensenich)	1000 hours
74DC-0-60 (Sensenich)	500 hours
HC-M2YR-1BF/F7666A-2R (Hartzell)	1500 hours
HC-M2YR-1BF/F7666A (Hartzell)	1500 hours
Exhaust System	Replace when condition warrants
Exhaust System (Elano)	Every 800 hours or when condition warrants
Magneto	At engine overhaul
All Hose	Replace when condition warrants

*Refer to Lycoming Service Instructions No. 1009T for detailed overhaul period instructions.

**Refer to the current revision of Continental Service Bulletin No. M68-15 for detailed overhaul period instructions.

FUEL SYSTEM	
Fuel boost pump	At engine overhaul
All Hose	Replace when condition warrants